Reference Manual

14,400 & 28,800 BPS FAXMODEMS

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Introduction

Welcome to the *Reference Manual*. You should have already read the *Getting Started* manual for information on setting up your modem and using it for basic tasks. Now that you are familiar with your modem's basic operations, you are ready to learn more about its advanced capabilities.

This manual provides a brief discussion of fax protocols, fax command sets, and fonts used in faxing. It does not describe the fax commands in detail or explain how to program the modem's fax functions, because your fax software should provide all the functions you need. Refer to your fax software manual and Chapter 1 of this manual for additional information on the modem's fax features.

This manual also contains detailed information about your modem's data communications capabilities and how to use them. It includes detailed instructions on using your modem's "AT" commands to perform tasks your software can't, and explains the modem's error correction and data compression features. It also includes a troubleshooting chapter to help you if you are experiencing problems and a glossary of telecommunications terms that should help you understand this technology.

This manual does not explain fax or telecommunications software. Please refer to your software manuals for information on using a particular program.

Your modem and software manuals should help you with any questions you have about using your modem, but if you need further assistance, please consult Chapter 9 or see Chapter 10 to contact us directly. Enjoy your modem!

Table of Contents

INTRODUCTION 1

1 FAX ISSUES 5
Class 1, 2, & 2.0 Fax Commands 5
Fonts Used When Faxing 6
Software Authors 6

2 USING AT COMMANDS 8
Issuing Commands Yourself (Terminal Mode) 8
Command State & Online State 9
Escape Code (+++) 9
Command Line Syntax Command Line Syntax 10
Command Line Buffer Command Line Buffer 10
Result Codes 10

3 HIGH-SPEED COMMUNICATION 11
28,800 bps Connections 11
14,400 bps ConnectionsV.FC, V.34 and V.32bis 12
Select Modulation 12
Serial Port Speed 16
Faster UART Chip for PC Compatibles Used with External Modems 17
Slow Downloads 18
Multitasking 18
Macintosh 19
PCs & Compatibles 19
All Platforms - Processor Speed 19
Flow Control & Hardware Handshaking Cables on External Modems 19
Do You Have a Flow Control/Hardware Handshaking Problem? 20
Should You Use Hardware or Software Flow Control? 20
How to Get a Hardware Handshaking Cable 21
Line Noise 21
Line Noise Problems on Fax Calls Fax Line Noise 21
Line Noise Problems on Data Calls Data Line Noise 22
Rate Renegotiation 22
Troubleshooting High Speed Data Connections 26

4 ERROR CORRECTION & DATA COMPRESSION 29
Start with the Basics 29
How Error Correction & Data Compression Work 31

Data Compression 31
Connection Rates 32
How the Modem Determines Connection Speed & Protocol 32
After Connecting 32
Connection Types 33
\N1 33
\NØ 33
\N2 34
\N3 AutoReliable Mode 34
\N5 MNP Reliable Mode & \N4 LAPM Reliable Connection 34
Flow Control 34
The Configurations Most People Need 35
Using Xmodem, Ymodem, or Pre-Compressed Files 35
MNP 5 Data Compression 35
V.42bis Data Compression 35
Error Correction 36

5 DIALING 37
Using the Dial Command 37
Dialing from a Telephone 38
Storing a Telephone Number 39
Dialing a Stored Telephone Number 39
Automatic Pulse Dialing 39
Disabling Call Waiting 40

6 ANSWERING 41
Answering Calls 41
Caller ID (Optional Feature #142) 42
What is Caller ID? 42
Potential Applications 43
Can You Use Caller ID? 43
Software Options 44
Caller ID AT Commands 44
How to use Caller ID with Telecommunications Software 44
Silent Answer 46
What is Silent Answer? 47
Using Silent Answer 47
Enabling Silent Answer 51
Silent Answer Plus 55
Adaptive Answer 55

7 CONNECTING 57
Bell & ITU-TSS Protocols 57
Connection Rates 59
Connection Types 59

8 CUSTOM MODEM CONFIGURATIONS 61
Do You Need to Configure Your Modem? 61
Factory Default, Active, & Stored Configurations 61
Creating a Custom Configuration Custom 62
&F, &F1, &F2 The Factory Configurations 63

9 SOLVING PROBLEMS 64
Double Check Your Equipment & Configuration First Step 64
Problems Encountered While Offline 65

Problems When Trying to Connect 68
Problems While Connected 69
Problems with High-Speed Connections 73
Problems with Silent Answer 74
Miscellaneous Problems 80

10 IF YOU NEED HELP 83
When You Contact Supra 83
Ways to Contact Supra 83
Returning Product 88
Supra Bulletin Board System (BBS) 88
Connecting to the Supra BBS 88
Supra BBS File Area 89
How to Find Files in the File Area 89
Commonly Used Files 90

A OPTIONAL FEATURES 91
101 *Fax Class 1 Class Standards* 91
104 *Fax Class 2 Class Standards* 91
105 *Fax Class 2.0 Class Standards* 91
115 *ITU-TSS V.17, 14,400 bps Fax V.17* 92
120 *Worldwide Support* 92
121 *ITU-TSS V.23 V.23* 92
122 *ITU-TSS V.25bis V.25* 92
123 *Blacklisting* 92
124 *Access Security* 92
140 *ITU-TSS V.32bis, 14,400 bps Data* 94
141 *Silent Answer* 94
142 *Caller ID* 94
143 *MNP 10* 94
144 *MNP Cellular* 94
145 *AutoSync* 94
146 *Enhanced Configuration Display* 94
147 *V.FC 28K* 94
148 *Volume Cntrl L+/L-* 95
149 *V.FC 24K* 95
150 *Enhanced &F Option* 95
151 *Enhanced Rate Renegotiation Enhanced* 95
153 *ITU-TSS V.34 V.34* 95
154 *Silent Answer Plus* 95
157 *RINGING Response* 96
160-162 *Supra Voice Processing™ (SVP).* 96
170 *Handset Support.* 96
171 *Headset Support.* 96
180 *16550 UART Emulation* 96
181 *SupraSmart UART* 96
182 *Rockwell High Speed Interface* 97
190 *AMD Flash ROM AMD* 97
191 *ATMEL Flash ROM ATMEL* 97

B AT COMMAND DESCRIPTIONS 98

C RESULT CODES 112

D S REGISTER DESCRIPTIONS 116

E RS-232C PIN ASSIGNMENTS 123

F FCC & DOC RULES 124

G RESOURCES 127

GLOSSARY 128

INDEX 133

1

Fax Issues

The most important thing you need to know about fax standards (sometimes called protocols) is that the faxmodems and machines you connect to must support the standards you use.

Group 3, ITU-TSS Protocols, and Connection Rates

Group 3 and the ITU-TSS protocols are standards that let fax devices (fax machines and fax modems) communicate with each other. They are defined by the international ITU-TSS standards committee, which was previously known as the CCITT.

Group 3 specifies image resolution, complex data compression, and other features such as connection rates. The vast majority of fax devices in use today support Group 3.

Group 3 includes three protocols that allow fax communication at specific connection rates — the ITU-TSS protocols, which include V.17, V.29, and V.27ter. V.17 defines communication at various speeds up to a maximum of 14,400 bps, V.29 defines speeds up to 9600 bps, and V.27ter defines speeds up to 4800 bps. Most fax machines today communicate at 9600 bps, but because of relatively recent technological advances and the proliferation of faxmodems supporting V.17, 14,400 bps fax connections are becoming much more common.

Class 1, 2, & 2.0 Fax Commands

Class 1, 2, and 2.0 are the command sets used by fax software to control a faxmodem. These fax commands are invisible to you when you use fax software. Class 1 is an officially approved standard. Class 2 is a de facto standard that has never been approved but is in widespread use throughout the industry. A new version of Class 2, called Class 2.0, has recently been approved but has not been adopted by the industry, and will not be useful until fax software is available that supports it.

These fax command sets are optional features that are only available on select modem models. Class 1 is option #101, Class 2 is option #104, and Class 2.0 is option #105. The **I10** command tells which optional features your modem supports. Chapter 2 explains how to issue commands.

Do you need to specify Class 1, 2, or 2.0? The answer is usually no, but it depends on your fax software. Some fax software automatically determines which class to use. For other software, you need to select the pre-defined configuration that came with your modem or software. The predefined configuration will automatically set the modem to the appropriate class. If your software comes with this type of configuration (the software shipped with your modem does), it should be fairly simple to install. If you need help, your fax software manual should be able to help you. Less frequently, some fax software does require you to select either Class 1 or Class 2. If you find that you have problems using one, you may want to try using the other.

Fonts Used When Faxing

To ensure the best quality fax output in Macintosh™ and Windows™ environments, it is very important that you use both screen and printer fonts, and if applicable, also use Adobe Type Manager (ATM)™ or TrueType™. A common mistake is using a font that is built into your printer for which you have a Screen font, but not a Printer font. The type will appear fine on your screen but be faxed in blocky letters because it used the Screen font to create each character. The solution is to use a font with both Printer and Screen fonts or to obtain the printer font you need.

Software Authors

Available fax software should provide all the fax functions you need. However, if you are an advanced programmer and want to write fax software, you can obtain information about fax commands from the following sources. (This information is provided for software authors, not novices. Most users will not find it helpful.)

- The following publications are available from Global Engineering Documents, 714-261-1455, 2805 McGraw Ave., Irvine, CA 92714. Additional phone numbers: 800-624-3974 in U.S., 800-854-7179 outside U.S.
  - *EIA/TIA-578 (Class 1)*

- *EIA/TIA-592 (Class 2)*
- *ITU-TSS Volume VII, Fascicle VII.3, Recommendations T.0-T.63*

- The following Macintosh-specific tool is available from STF Technologies, 816-463-2021, Junction I-70 and Highway 23, Concordia, MO 64020: *The STF Developer's Kit*.
- The following PC-specific fax driver and utilities (for both DOS and Windows) are available for license by faxing a request to Thought Communications, Inc. Developer Relations, 408-452-1011 (fax): *Fax Application Programming Interface (FAPI)*.

2

Using AT Commands & Result Codes

When you use your telecommunications software to perform a task (such as dialing a phone number), it uses the modem's AT commands to perform the task. It is usually easier to let your telecommunications software issue the commands for you than it is to issue the AT commands yourself.

When your telecommunications software can't perform a task (or you don't want it to), you'll issue the AT commands yourself. These commands can be used to perform various tasks, from hanging up to changing your modem's speaker volume.

Various chapters in this manual explain how to use the **AT** commands to accomplish specific tasks. The rest of this chapter explains how the **AT** commands work, and Appendix B explains them all in more detail.

Issuing Commands Yourself (Terminal Mode)

To issue AT commands yourself, you must be in your software's "terminal mode" — also called "local" mode. In this mode, the commands you type go to the modem rather than to your software or the remote computer.

Some software is in terminal mode as soon as you start the program. If the modem responds with the OK result code when you type the following, you are in terminal mode and ready to issue commands ([CR] represents a carriage return):

AT [CR]

If you are not in terminal mode, refer to your software manual to determine how to get there.

Command State & Online State

The modem can operate in the command state or the online state:

- When you first turn your modem on, it is in command state. It must be in command state to issue AT commands.
- When your modem connects to another modem, it automatically changes to the online state. Your modem must be in the online state for data to be transmitted.

If you're connected to a network, Bulletin Board System, or other remote computer (i.e. you're online) you can transmit data, but you must change to command state to send AT commands.

To switch from one state to the other, use the methods below.

- To switch from online to command state, type the escape code (**+++**) as explained below. This automatically puts you in terminal mode, ready to type commands.
- To switch from command state to online state, issue the **ATO** (go back on-line), **ATA** (answer a call), or **ATD** (dial a number) command. An explanation of proper command syntax can be found in the section entitled *Command Line Syntax* later in this chapter. The **ATO**, **ATA**, and **ATD** commands are described in Appendix B.

Escape Code (+++)

The escape code is a string of three ASCII plus signs (**+++**) preceded and followed by a "guard time" during which no other data is transmitted. It is used to leave the online state without hanging up. To use it, do the following:

1. Send a character.
2. Do not transmit any data for a period equal to the guard time. The default setting for the guard time is 1 second.
3. Type the escape code quickly. DO NOT hit the Return key when you finish typing the escape code.
4. Do not transmit any data for another period of time equal to the guard time.

The modem responds to these steps with the **OK** result code. If it doesn't, either it received data during the guard time or the escape code was typed too slowly. The time between each plus sign ('**+**') in the escape code

should not exceed the guard time. The plus signs in the escape code can be changed to another ASCII character by changing the value in register **S2**. Chapter 8 and Appendix C provide information on setting S registers.

Command Line Syntax

The prefix **AT** (think "ATtention") must start each command line except **A/**. The modem examines the AT code to determine your computer's serial port rate, parity, word length, and number of stop bits, and then stores your current configuration in its memory.

Multiple commands can appear on one command line. You can separate these with spaces to improve readability if you like (the modem ignores the spaces).

Each command line (except **A/**) must end with a carriage return [**CR**]. The command is not acted upon until the Return key is pressed.

The following are examples of valid command lines:

AT DT 555-5055 [CR]
ATH [CR]
AT &F &C1 &D2 &W [CR]
A/

Command Line Buffer

The modem places each command issued into a command buffer that holds up to 250 characters. The modem does not place the AT, carriage return, or line feed characters into the buffer, so the buffer's 250 spaces only hold actual command characters. If a command line contains more than 250 command characters, the modem ignores the commands and displays the **ERROR** result code.

Result Codes

After the modem receives a command, it returns a result code. The most common result code is **OK**, which means the modem understood your command. Other result codes are listed in Appendix C.

Result codes can be represented by English words or with numbers. Words are preceded and followed by carriage return and line feed characters. Numbers are followed by a carriage return. Refer to the **V** command in Appendix C for more information.

3

High-Speed Communication

This chapter addresses some of the issues that you should be aware of as you work with modems that communicate at speeds of 14,400 bps and above. While your modem is designed to communicate at high speeds, other factors may contribute to the actual speeds that you achieve during communication sessions. The information in this chapter helps you identify factors that may limit high-speed communication and suggests possible solutions that will help you experience the highest possible speeds for your modem.

28,800 bps Connections

Your modem supports 28,800 bps connections with modems from many different manufacturers. However, it is not realistic to expect that you will always be able to achieve full 28,800 bps data speeds every time you attempt to connect with another 288 modem. Line conditions, serial port speed, and other factors will impact on actual connection speeds.

Unlike earlier modems, 28,800 bps modems are designed to modify their actual transmission speeds during a data connection. This means that very minor difference in the phone line can have a significant impact on the connection. For example, during one attempt at making a connection, you might connect at only 19,200 bps while a later call on the same lines and to the same modem may result in a 28,800 bps connection.

One of the reasons for these variable results is that speeds of 28,800 bps are higher than normal analog phone lines were designed to handle. Data communications of 28,800 bps are best achieved when the phone lines between the two modems are of high quality and are free of limiting factors such as line noise.

Another factor to keep in mind when you are attempting high speed communication is the modem on the other end of your connection. While all 288 modems use the same core technology, not all of them may be as capable as yours. If you are unable to achieve the top data speeds, it may

be that the modem to which you are connecting is adjusting the speed down because it is unable to communicate at top speed. The slow-down may also be because the computer at the other end of the connection is not capable of the highest speeds as noted in sections below which address serial port speed, UART technology, and processor speed issues.

14,400 bps Connections: V.FC, V.34 and V.32bis

Your modem supports three types of connections at 14,400 bps: V.34, V.FC, and V.32bis. 14,400 bps is the minimum speed negotiated under the V.FC protocol. It is the highest speed possible with V.32bis. If your modem has an alphanumeric display, it shows a series of status display messages depending on the type of connection you have made. In the examples below, an LAPM connection has been made.

Types of Connection	Status Display Messages
V.32bis	CD LP 144
V.FC	CD LP VF 144
V.34	CD LP V34 144

In general, if you have a 288 modem and are communicating with another 288 modem, your connections are made using your modem's protocol. If the remote modem does not support the protocol you are using, the connection is made at V.32bis or the highest speed it supports.

Selecting a Modulation to Control High Speed Connections

If your modem uses the V.34 protocol, you can control the modulation your modem uses to negotiate a connection by entering the **+MS** command. This command allows you to select a specific modulation, enable or disable automode, and specify the highest and lowest connection rates for your modem. You use a variation on the **+MS** command to report selected options and supported options.

The command format for AT+MS is:

AT+MS = <mod>,<automode>,<minimum rate>,
<maximum rate> [**CR**]

For example, to set your modem to operate as a V.FC modem, you would enter: '**AT+MS = 74,1,14400,28800 [CR]**.

You can leave a parameter at its current value by leaving that parameter's place blank and entering a comma to separate the parameters or by entering a carriage return ([**CR**]) if it is the last parameter. For example, if you want to change the selected modulation from the V.FC setting mentioned earlier (+MS=74,1,14400,28800) to a V.34 setting and leave automode enabled and leave the <maximum rate> at 28800, you would enter the following:

AT+MS=11,,300,[CR]

The <mod> Parameter

To specify a preferred modulation, enter a decimal number from the <mod> column of the following table. The default modulation is 11.

<mod>	Modulation	Possible Rates (bps)[1]	Notes
0	V.21	300	
1	V.22	1200	
2	V.22bis	2400 or 1200	
3	V.23	1200[2]	
9	V.32	9600 or 4800	
10	V.32bis	14400, 12000, 9600, 7200, or 4800	
11	V.34	28800, 26400, 24000, 19200, 16800, 14400, 12000, 9600, 7200, 4800, or 2400	Default
64	Bell 103	300	
69	Bell 212	1200	
74	V.FC	28800, 26400, 24000, 19200, 16800, or 14400	

[1] See optional <automode>, <minimum rate>, and <maximum rate> parameters.

[2] For V.23, originating modes transmit at 75 bps and receive at 1200 bps; answering modes transmit at 1200 bps and receive at 75 bps. The rate is always specified as 1200 bps.

If automode is enabled, and your modem can't make a connection at the modulation you have chosen, your modem tries to automode to a different modulation. Your modem hangs up if it can't make a connection and the modulation you selected doesn't permit automode. For example, there is no standard way to automode from Bell 103 to V.23. So, your modem would hang up if you had set the <mod> parameter to 64. See the section on the <automode> parameter for more information.

The <automode> Parameter

The <automode> (automatic modulation negotiation) parameter is an optional numeric value that enables or disables automatic modulation negotiation using V.8 or V.32bis Annex A.

The default value, 1, enables automode. However, there are modulations for which automatic negotiation is not available, such as Bell 212 (<mod> 69).

The following table gives you the available automaode options:

<automode>	Option Selected	Notes
0	Automode disabled	
1	Automode enabled using V.8 or V.32bis Annex A	Default

Setting <automode>

If you set <automode> to 1, your modem attempts to connect at the highest possible rate available through either V.8 or V.32bis Annex A. If your modem cannot make a connection at that speed, it automatically negotiates the rate downward until a connection is made. For example, if you issue the command **AT+MS=10,1,1200,14400** the modem starts negotiating the rate downward from V.32bis 14400 bps if a connection is not made.

If you set <automode> to zero, your modem tries to connect at the highest speed available for the modulation you have selected and will *not* negotiate if a connection cannot be made. For example, if you give the command **AT+MS=9,0,1200,4800** the modem operates using V.32 at 4800 bps with no negotiation.

The <minimum rate> Parameter

The <minimum rate> is an optional number that specifies the lowest rate at which the modem may establish a connection. The default is 300 bps.

The <maximum rate> Parameter

The <maximum rate> is an optional number that specifies the highest rate at which the modem may establish a connection. The default is 28800 bps.

Reporting the Options You Selected Through +MS?

You can use **AT+MS?** to display the options you have selected in the **AT+MS** command. The modem displays the selected options in the following format:

<mod>,<automode>,<minimum rate>,<maximum rate>

For example, if you enter **AT+MS?**, your modem might display **11,1,300,28800**. This means that the options currently selected on your modem are: V.34, automode enabled, the minimum rate is set at 300 bps, and the maximum rate is set at 28800 bps.

Reporting Options Supported by +MS

You can use **AT+MS=?** to display the options supported by your modem. The modem displays a list of the selected options in the following format:

[list of the supported <mod> values],[supported <automode> values],[supported <minimum rate> values],[supported <maximum rate> values]

Factors That Effect +MS Stored Settings

The **+MS** command has one active setting, and one stored setting that is separate from **&WØ** and **&W1**. It is possible to inadvertently change the stored setting of **+MS**. If **+MS**'s maximum speed is changed, it remains at the lower rate until you reset it.

For example, your DTE is set to a rate of 57,600 bps and you enter an **ATFx** command. Your active **+MS** setting is 11,1,300,28800 (the default setting).

Entering an **ATFx&W** command (or **ATFx&W1**) stores your current active setting. If you reset your DTE rate to 9600 bps and either dial out or do a **ATFx**, your active **+MS** setting is changed so the maximum connect speed is 9600 bps (the highest legal value being equal to, or less than the DTE.).

Once you increase your DTE rate back to 38,400 bps or above, you can reset your active **+MS** setting to the stored values by entering an **ATZ** command. If you saved the 9600 bps setting to the stored configuration with the **AT&W** command, you can change the active setting using the **AT&Fx** or **AT+MS** command. Then save the higher maximum speed to the stored configuration using **AT&W**.

So, if you drop your DTE rate to a slow rate, as long as you don't do an **AT&W** at the slower setting, all you need to do is an **ATZ** after increasing the DTE rate again to reset the maximum speed.

s37 and +MS

When you set the **S37** register, it overwrites and changes the **+MS** settings. The **S37** register in your **&WØ** and **&W1** stored settings have priority over whatever is stored in **+MS** when you reset your modem. You can use the **S37** register for V32bis and below, but you have to use **+MS** to control the higher speeds

s110 and +MS

S110 can override the **+MS** settings. See the section later in this chapter titled "Setting the Rate at Which Negotiations Occur" for details.

Serial Port Speed

Many computers have not been designed for the high-speed performance requirements of your modem. The main problem encountered is data coming into the computer faster than it can accept it, resulting in lost data. Hardware handshaking takes care of some of this, but sometimes the computer is so tied up with another process that it can't even do handshaking. With data coming in at speeds up to 115,200 bps (using V.42bis compression), the computer must be very attentive to the serial port.

If you are using a Macintosh with a high-speed NuBus serial card or other high-speed adapter, or a PC with a 16550 UART, you may be able to achieve actual throughput up to 115,200 bps. However, you should be aware that your V.34 modem will not establish DCE (modem to modem) connections higher than the DTE (modem to computer) speed set in the software. For example, if you set the speed to 19,200 the modem pair never connects faster than 19,200 bps regardless of the maximum speed that both modems support. To achieve connection speeds of 28,800 bps, the port must be set to at least 38,400 bps in the software.

For more information on computer rate, connection rate, error correction, and data compression, refer to Chapter 4.

Speed Limitations of the Macintosh

Most Macintosh computers do not support DTE speeds above 57,600 bps, and do not work properly above 38,400 bps. If you have one of these computers, you will achieve the best results if you set the DTE speed no higher than 38,400 bps. This applies to PowerBooks and to all desktop Macintoshes except those with model names ending in "AV" and PowerMacs. If you have an AV Macintosh or a PowerMac, you can set your DTE speed to 57,600 with no problem.

If you have a Mac into which you can install a NuBus card, you may be able to boost the data throughput speeds by adding a high-speed serial board or other high-speed adapter to your computer.

Faster UART Chip for PC Compatibles Used with External Modems

Most older and some newer PCs use the 8250 UART or 16450 UART chip for serial communications. This chip was not designed for today's high speeds and has a limited buffer capacity which simply cannot keep up with faster PCs and transmission speeds. If your existing chip is socketed, you may be able to replace this chip with the 16550 UART (which has a 16-byte buffer more suitable for high-speed transfer). In some cases, it may be easier for you to add a new serial card with a 16550 UART to your system. This may help solve problems of lost data. Contact your computer dealer for help and advice in upgrading your existing serial card.

If a 16550 UART is not an option for you and your computer is too slow (indicated by lost data due to the buffer overflowing), use your software to

set your serial port to a slower rate (such as 19,200 or 9600). For instance, some laptops do not have a 16550 UART, and may require the computer rate to be set slower than the connection rate.

If you are using an internal modem board on your PC, you will not need to be concerned about the UART chip. The internal board emulates a buffered UART and you should not experience loss of data due to UART capability.

Slow Downloads

If you download files from a BBS or online service using Zmodem, you should expect a CPS (character per second) rate about 1/10th of your connection rate; i.e. 28,800 bps = 2880 cps. This is because it takes 10 bits to transmit each character. If you turn on V.42bis compression (V.42bis is the default setting) and download an uncompressed file, the speed may be 2-4 times as fast. However, many files are already compressed and you will not see this improvement. But even on pre-compressed files, with V.42bis you should always see about an 18% improvement due to efficiencies in the protocol. A 28,800 bps connection yields about 3200 cps; a 14,400 bps connection, about 1600 cps.

However, this is in an ideal situation. In the real world you will find that there are many factors that can slow transfer speeds. Your computer or software may not keep up. Slow disk drives on either end can slow it down. The remote system may have many users on it, slowing it down. (You may find that your best download speeds on many services are late at night when few users are on the service.) And some services are notorious for slow downloads in general. A download of 600 - 700 cps on a CompuServe 14,400 bps line is not uncommon.

For more information on this topic, refer to Chapter 4.

Multitasking

Multitasking computers allow you to do many different things while other operations take place in the background. Background operations can be complex and can sometimes demand too much of your computer's attention to allow high-speed communications. High-speed transmissions are more reliable in a single-user situation with as few applications as possible in use. This section lists some specifics that can interfere with high-speed communications, depending on your platform.

Macintosh

AppleTalk/AppleShare activity (including printing) can lower the transmission rate because this activity has a higher priority than other serial communications. Some inits, extensions, and control panels may also cause problems. If transmissions are very erratic, you might want to try turning off AppleTalk and/or disabling extensions temporarily. This sometimes helps to achieve reliable data transfers, and fax connections in some cases.

PCs & Compatibles

Please see the "Faster UART Chip" section earlier in this chapter. TSR (terminate stay-resident) programs can also slow the transmission rate. For throughput over 19,200 bps, your computer should have a 386 or faster processor. Multitasking performance varies:

- Windows 3.1 correctly supports up to 38,400 bps with a 16550 UART.
- Windows NT, Windows 95, and OS/2 2.X and above should have few problems with multitasking.

All Platforms - Processor Speed

Another general rule is the faster processor that your machine has, the better it performs high-speed transfers. A Power PC, 68030/68040, Pentium, or 386/486 machine will probably do better than a 68000 or 80286.

Flow Control & Hardware Handshaking Cables on External Modems

To communicate at high speeds, it is CRITICAL that you use a cable with "RTS/CTS Hardware Handshaking." With error correction and data compression, the modem can often send information to the computer faster than it can accept it. When this happens, the computer tells the modem to slow down. Similarly, if data is not sent correctly to the modem and needs to be resent, the modem needs to be able to tell the computer to wait. This is called "flow control" or "handshaking" and helps to prevent data from being lost because the computer or modem was busy.

Do You Have a Flow Control/Hardware Handshaking Problem?

One clue to a flow control-related problem is if you are able to make a connection but nothing else happens, or if you cannot start the download/upload process. If this happens, your modem is probably configured for hardware flow control but your cable or software does not support it. If you suspect your cable may be causing problems, use your software to set your computer rate to 2400 bps, and type the command **AT&FØ** to disable error correction and data compression. Be sure to issue the **&FØ** and dial using the **ATD** command from your telecom software's terminal mode. If your software dials automatically, it may re-initialize the modem without your knowledge, causing problems. If the 2400 bps/**&FØ** configuration solves the problem, hardware flow control is probably at fault, which often indicates a cable problem.

If you are using a Macintosh computer and NOT using the cable that came with your modem, it is even more likely that your cable doesn't support hardware handshaking. The most common symptom is the modem connects, but nothing else happens.

Hardware handshaking cables are wired differently for different computers. If you think you have a hardware handshaking cable but you still have cable-related problems, your cable may not be wired properly. If you need assistance, please contact your local computer dealer. A pin diagram is available from the faxback system listed at the back of this manual.

Chapter 4 provides more information.

Should You Use Hardware or Software Flow Control?

We recommend that you enable hardware (RTS/CTS) flow control rather than software (XON/XOFF) flow control because the results are generally faster and more reliable. If you are using the Xmodem or Ymodem file transfer protocols, you *must* use hardware flow control.

To enable hardware flow control:

1. Use a hardware handshaking cable.

2. Use your software to turn ON hardware (RTS/CTS) flow control. This should automatically turn OFF software (XON/XOFF) flow control, but you may need to use your software to manually turn off software (XON/XOFF) flow control.
3. Issue the **&K3** command to turn ON hardware flow control in the modem. (This is the default, and **&F1** and **&F2** also both include **&K3**.)
4. Issue the **&W** command to save the setting.

How to Get a Hardware Handshaking Cable

If your modem didn't come with a cable or you've lost your cable, your local dealer should be able to provide you with one that supports hardware handshaking. When you ask for a new cable, be careful to specify that it needs to support hardware handshaking. If your modem came with a cable, it supports hardware handshaking.

Line Noise

Line noise is frequently a source of problems with high-speed modem connections. The following sections provide an overview of potential problems and suggestions for troubleshooting to determine the impact of line noise on your modem connections.

Line Noise Problems on Fax Calls

Line noise is not a common cause of problems during fax calls. If line noise is causing problems during a fax call, one of the following will happen:

- Your modem connects, but fax transmissions are flawed (unreadable faxes, missing sections).
- Your modem connects but then disconnects unexpectedly.

If you think you are having fax line noise problems, try getting a clearer connection by redialing. If that doesn't help, wait a while and try redialing again. This should solve the problem, but if necessary, and if your fax software allows it, you can also try using your fax software to set your fax transmission rate lower.

Line Noise Problems on Data Calls

With data calls, line noise can cause numerous problems. In general, the faster you communicate, the better your phone lines need to be. When you reach speeds higher than 14,400 bps, it is critical that you have clear lines from end to end. Line noise, which can be introduced at the remote site, by the phone lines, or at your local site, can cause the following problems when trying to make high-speed data connections:

- No connection.
- Connection, but only "garbage" characters appear on screen.
- Connection, but no communication.
- Connection, then disconnection for no apparent reason.
- Connection, but modem speed drops.

If you think you are having data line noise problems, try redialing. When you redial the phone company will probably route your call through a different circuit, which could result in a clearer connection. If that doesn't help, wait a while and try redialing again. This should solve the problem, but if necessary you can also try using your telecom software to set your transmission rate lower. The section in this chapter called "Rate Renegotiation" provides information on setting your transmission rate.

Rate Renegotiation

Modems with optional feature #151 provide special commands and S registers for manipulating the rates at which your modem can connect. This section explains those commands and S registers. The **I10** command reports which optional features your modem supports.

Initiating Rate Renegotiation (%G)

The V.32bis (14,400 bps) specifications state that:

- Your modem must be able to shift down or up in speeds (called Rate Renegotiation) *when the remote modem initiates the rate change*.
- Optionally, your modem can initiate a rate change.

Because initiating a rate change is optional, some V.32bis modems cannot initiate a rate change. Your modem CAN initiate a rate change upon changing line conditions.

The %G command controls this feature. Basically, %GØ causes your modem NOT to initiate Rate Renegotiation, and %G1 allows your modem to initiate Rate Renegotiation upon changing line conditions.

The %G1 command is somewhat complex, and it works slightly differently on V.32 and V.32bis connections. On V.32bis connections, as line conditions change your modem automatically initiates Rate Renegotiation. On V.32 connections, as line conditions change your modem automatically initiates Rate Renegotiation during a Retrain. You can also request an immediate Retrain by issuing the escape code (+++) to enter command mode, and then issuing the ATO1 command.

A Retrain during a V.32 connection can last approximately 30 seconds and, on some models, causes the modem's **RT** message to be displayed. A Retrain causes your modem to:

1. Change the connection rate to 4800 bps.
2. Analyze the quality of the phone lines and optimize the connection if possible.
3. "Tell" each other which rates they support ("negotiate").
4. If %G1 (or the other modem's equivalent) has been issued, and line conditions warrant, switch to the next possible rate both modems support, as defined by S109. The upcoming section called "Setting the Rate at Which Negotiations Occur (S109 & S110)" explains S109.

By comparison, at V.32bis, **%G1** causes both modems to perform only step 4, which is a much quicker way to do essentially the same thing.

%GØ On V.32bis connections, as line conditions change, your modem will NOT automatically initiate a rate change (Rate Renegotiation) — although your modem can change rates if the remote modem requests it. With **&FØ**, **%GØ** is the default.

%G1 On V.32bis connections, as line conditions change, your modem automatically initiates Rate Renegotiation. On V.32

connections, as line conditions change your modem automatically initiates a Retrain AND Rate Renegotiation, regardless of the **%EØ** setting (because V.32 connections require a Retrain to change rates). With **&F1** and **&F2**, **%G1** is the default.

Requesting a Retrain (%E)

The **%E** command is most useful if you want your modem to Retrain (**%E1**) without Rate Renegotiation (**%GØ**) when line conditions are bad.

%EØ Do not request a Retrain. Default with **&FØ, &F1**, and **&F2**.

%E1 Monitor line quality and automatically request a Retrain if line conditions are bad.

%E2 Monitor line quality and initiate rate renegotiation to a lower rate. If the line quality remains sufficient for one minute, the modem renegotiates to a higher speed.

Setting the Rate at Which Negotiations Occur (S109 & S110)

Negotiation is the process where your modem and the remote modem determine what type of connection to make. The V.32bis standard negotiates the connection rate at 4800 baud, and then goes to the agreed connection rate to negotiate error correction/data compression. On noisy lines this can cause various connection problems.

The solution is to set register S110 = 3. This causes the modems to connect at the slowest possible connection rate (which is specified in S109 or the **+MS** command if you are using the V.34 modulation). Then the modems can negotiate the error correction/data compression protocols without problems from noisy lines. With S110=3, as long as the line is clean enough, the modems then upshifts to the next possible connection rate.

Some modems can only upshift a few times during one connection, and then they lose the connection. The solution to this problem is to change S109 so that the modem does not need to upshift as many times.

S109

S109 defines a range of speeds that are available on your modem. It is used when negotiating the available speeds for a connection, both when a connection is first established, and during a Retrain. Most brands of modems have S109 or a comparable register. S109 only applies to V.32 and V.32bis connections. S109 can contain the following values (the default is S109=62):

1	reserved
2	4800 bps
4	7200 bps
8	9600 bps
16	12000 bps
32	14400 bps
64	reserved
128	reserved

S110

S110 allows you to enable or disable V.32, V.32bis, V.FC, or V.8/V.34 on your modem. Use the S110 register to limit connect speeds to 14400 or below.

Bits	Value	Setting
bits 0-1	(0)	0 = V.32 no rate adjust.
	(1)	1 = V.32/V.32bis no rate adjust
	(2)	2 = V.32/V.32bis with rate adjust
	(3)	3 = V.32/V.32bis, connect at lowest speed as set in the **+MS** command.
Default adjustment	(14)	V.34, V.FC, and V.32bis with rate

IMPORTANT — S110 does *not* change the settings in either the active or stored **+MS** configuration. To control DCE speeds in V.FC or V.34 (above 14,400 bps), you need to use the **+MS** command. For more information on S registers and how to set them, refer to Chapter 8 and Appendix D in the Reference Manual.

Troubleshooting High Speed Data Connections

If you have trouble making a high-speed data connection, you need to first determine the cause of the problem, as described in the next section.

Identifying the Source of the Problem

Noise can be introduced at the remote site, by the phone lines, or at your local site. Before making any changes, try calling a few different remote modems, to see if you have the same line noise problems in each instance.

Try the following steps to identify the source of the problem.

- Hang up and dial again. Sometimes this simple change makes a significant difference.
- Determine the capabilities of the modem on the other end of the connection. For example, is it a V.32bis, V.FC, or V.34 modem? There are some other modems with proprietary standards. You will be able to connect with most of those at 14,400 bps, but no higher.
- If you only have problems when calling one location, it is probably a problem on the remote end.
- If you have problems occasionally when calling the same location it is probably a long distance connection problem. You may want to call at a different time or try a different long distance company (for example, you could try dialing the 10288 prefix to get an AT&T line).
- If you have the same problems with every attempt, the cause is probably on your end. Follow the modem configuration directions that follow.

Testing Your Modem for High-Speed Configuration

If you determine that you have a problem in high-speed communication that may involve your modem, take the following steps.

#	Action	Explanation/ Comments
1	Make sure your modem is configured properly:	
	a. Use your telecom software to set your computer rate (serial port) to the highest speed supported by your computer—usually 38,400.	Your telecom software manual provides more information on steps a, b, and c.
	b. Use your software to turn ON hardware flow control and turn OFF software flow control.	
	c. Put your software in terminal mode.	
	d. From terminal mode, type **AT&F1 [CR]** (for Macintosh) or **AT&F2 [CR]** (for any other computer).	**[CR]** represents a carriage return.
2	Dial a number to find out if you can connect:	
	From your software's terminal mode, type the following. In place of *number*, type a phone number with which you have had line noise problems. **ATD *number* [CR]** DO *NOT* USE YOUR SOFTWARE TO DIAL THE NUMBER.	If you use your software to dial the number, it could change the configuration, causing problems.

#	Action	Explanation/ Comments
3	If you still cannot connect, there may be too much line noise to establish a high-speed connection. Try to connect using V.32 instead: a. Type **ATS110=0 [CR]**. b. Repeat Step 2.	S110=0 causes the modem to use the V.32 (9600 bps) protocol.
4	Disconnect other devices from the phone line: a. Unplug all other phone devices connected to the phone line on which you are trying to use the modem. Make sure there are no telephones, answering machines, other modems, etc. connected to any phone jacks on the telephone line. b. Repeat Step 2. c. If step 4a solved the problem, try to determine which device is causing the problem. Then unplug that device and work through this checklist again,	
5	Try using the modem at a different location.	
6	Briefly consider these rare causes: premise wiring, or the need for a second telephone line.	
7	Contact Technical Support.	

4

Error Correction & Data Compression

Your modem features error correction and data compression protocols that allow you to transmit data error-free at rates faster than the actual line connection rate. What may be a mystery now becomes clear once you have an understanding of what the modem is actually doing. Pay careful attention to this chapter to make sure you are using your modem to its fullest potential.

Start with the Basics

To understand the technology, you need to begin with some basic terms. For the definitions of other terms used in this manual, see the Glossary at the back of this manual.

Remote Modem

A remote modem is the modem you call and to which you connect.

Throughput

Throughput is the effective transfer rate. In general, on a 28,800 bps connection, data transfers at a maximum of 28,800 bps, meaning maximum throughput is 2880 characters per second. But on a 28,800 bps MNP 5 connection, where MNP 5 can compress the data to half its original size, throughput can be double that of the 28,800 bps connection without MNP 5, or 57,600 bps. The connection rate and actual transmission speed are still only 28,800 bps.

Connection Rate

The connection rate is the rate at which your modem and the remote modem connect, such as 14,400 bps or 28,800 bps. This rate is determined by the modems when they connect. Other terms using the

same definition include: Line Speed, Carrier Speed, Modem-to-Modem Speed, DCE Speed.

Computer Rate

The computer rate is the rate at which your modem and computer communicate. You change this rate in your software. With your modem, this rate should usually be higher than the connection rate. Other terms using the same definition include: Serial Port Speed, Modem-to-Computer Speed, DTE Speed.

Error Correction

Your modem supports V.42 (LAPM) or MNP 2-4 error correction. V.42 is the ITU-TSS error correction protocol. (ITU-TSS is an international standards setting committee which was previously known as the CCITT) V.42 uses LAPM as the preferred protocol and MNP 2, 3, or 4 if LAPM is not available.

MNP 2, 3, 4, and 10 are the MNP error correction protocols. MNP stands for "Microcom Networking Protocol (MNP)" after the company that developed these protocols. MNP 4 is often the highest level connection you can get on many of the commercial services like CompuServe™.

MNP 10 (optional feature #143) allows cellular communication, providing an extreme level of error correction on adverse connections. The I10 command tells which optional features your modem supports.

Data Compression

Your modem supports MNP 5 or V.42bis (BTLZ) data compression. MNP 5 is an MNP data compression protocol. It offers a compression rate of up to 2:1 ("throughput" to 28,800 (V.32bis) or 57,600 bps (V.FC/V.34)). MNP 5 connections also use MNP error correction.

V.42bis adds BTLZ data compression to the V.42 protocol. BTLZ is the data compression protocol used in V.42bis. It offers compression of up to 4:1 (throughput to 57,600 (V.32bis) or 115,200 bps (V.FC/V.34)). BTLZ connections require LAPM error correction.

Both your modem and the remote modem must support the same data compression/error correction protocols. If the other modem does not

support the same protocols that your modem supports, you can connect and communicate, but you will not be able to use all the protocols your modem supports.

How Error Correction & Data Compression Work

For error correction, the modem breaks your transmission down into blocks of data (frames) and calculates a checksum (the sum of all data bytes in the block). The block and its checksum are then transmitted. The receiving modem then calculates a checksum on the received data block and compares it with the received checksum. If these numbers are different, the data block was not transmitted properly, and the modem resends the data.

Error correction is useful for communications that occasionally experience a little telephone line noise or some other "glitch." However, error correction will not perform miracles on extremely noisy lines. If you have lots of errors, you may need to have your telephone circuits checked or change long distance carriers.

Data Compression

Data compression is accomplished by the sending modem analyzing the outgoing data for often repeated patterns of data (such as the letters "A" and "E" in English text). It then assigns a shorter data code that transmits faster than the original data. The more often the same data codes occurs in the transmission, the better compression the modem can achieve.

Certain file types like text files and graphics screens are very good candidates for optimal compression. Files that have already been compressed with a program like Stuffit, PKZIP, or ARC may only gain 10-15% additional compression with V.42bis and could even show a slight performance decrease with MNP 5. The compression rates of 2:1 for MNP 5 and 4:1 for V.42bis were determined as the maximums using a standard non-compressed test document. Additional information is provided later in this chapter.

Connection Rates

How the Modem Determines Connection Speed & Protocol

Your modem first tries to connect to the remote modem at the highest rate your modem supports (either 14,400 bps or 28,800 bps). If the remote modem can't connect at your modem's highest rate, your modem then tries to connect at the next highest rate. If that doesn't work, it continues trying the remaining speeds the modem supports, one at a time in descending order. (This process is called "fall back.")

If error correction and data compression are enabled (they are when shipped), the modem next tries to "negotiate" error correction and data compression protocols with the other modem. With your modem the order in which the protocols are tried is error correction, then data compression, and then a connection with no error correction or data compression. The protocols used are the most powerful protocols that both modems support.

Because your modem supports so many rates and protocols, this process can take several seconds to complete. If it seems to take an extremely long time, you may be having line noise problems; refer to Chapter 3.

After Connecting

Once connected, your modem sends your computer a result code that tells it the connection rate (for example, **CONNECT 28800** or **CONNECT 14400**). Depending on how your software handles the result code, you either see the result code on your screen, or you see your software's interpretation of it. If nonsense characters appear on your screen after this, the computer and connection rates are different.

With modems that don't support error correction or data compression, and with "Direct" connections (explained in the next section), if the computer and connection rates are different you must use your software to change your computer rate to match the connection rate. (Otherwise, you'll only see nonsense characters.) Some software automatically does this after looking at the **CONNECT XXXX** message. Once your computer rate and connection rate match, you can start communicating directly with the remote computer.

When using the default settings on your modem, the computer rate and connection rate do not have to match because of flow control (described later in this chapter). This lets your computer talk to your modem at a higher speed (say 57,600 bps) than your modem is talking to the remote modem (say 28,800 bps). This is useful because data rates vary when using data compression, but it causes problems with software that automatically adjusts the computer rate to match the connection rate.

For example, let's say you set your computer rate to 57,600 bps (in your software) and then make a 28,800 bps connection. Your modem could normally handle this, but when your software sees the **CONNECT 28800** message, it decides it has to change the computer rate down to 28,800 bps to match it — disabling your ability to take advantage of the higher throughput from data compression.

The modem has a way around this, however. In its default settings (**&FØ, &F1** or **&F2**), the modem returns a **CONNECT XXXX** message to the computer telling it the *computer* rate (DTE) and not the *connection* rate. In the previous example with the computer at 57,600 bps and the connection at 28,800 bps, it returns **CONNECT 57600** and your software stays at 57,600 bps. For more information, refer to the **W*n*** command description in Appendix B.

Connection Types

The following commands tell your modem what type of connection you want it to try. Do not use them during an active connection.

\N1 Direct Connection

If you use **\N1**, the modem acts just like a regular modem that doesn't support error correction or data compression. Your computer rate and connection rate *must* match.

\NØ Normal Connection

If you use **\NØ**, the modem still acts just like a regular modem, except that you won't have to change your computer rate to match the connection rate, you can use flow control. (Flow control is explained later in this chapter.)

\N2 LAPM/MNP Reliable Connection

If you use **\N2**, the modem tries to make an LAPM or MNP connection (MNP 5, 4, 3, or 2). If it can't, the modem hangs up. Reliable connections feature flow control.

\N3 AutoReliable Mode

If you use **\N3**, the modem tries to make the best connection possible. If it can make a V.42bis connection, it will. If not, it "falls back" through V.42 and MNP , trying each one until it is able to connect. (It will not attempt an MNP 5 connection if you've issued the **%CØ** command.) The connection the modem actually makes can be Reliable or Normal.

In most situations, you'll want to use **\N3**. It is the default set with either the AT&F1 or AT&F2 commands.

\N5 MNP Reliable Mode & \N4 LAPM Reliable Connection

If you use **\N5**, the modem tries to make a MNP connection without any kind of negotiation. If the modem can't establish a connection, the modem hangs up. If you use **\N4**, the modem tries to make a LAPM connection, and if it can't, it hangs up.

Flow Control

Normal and Reliable connections use a technique called "flow control" that lets your computer rate (computer-to-modem rate) be different than your connection rate (modem-to-modem rate). Flow control is useful with data compression because your throughput is *higher* than the connection rate and because the throughput *changes* depending on the compressibility of the data being sent. Flow control lets your modem and computer tell each other when they can accept more data for transmission and when to wait. This "handshaking" prevents data from being lost because the computer or modem was busy.

Your modem supports both "hardware" (RTS/CTS) and "software" (XON/XOFF) flow control. Hardware flow control (also called hardware handshaking) uses two of the modem's RS-232 lines for signaling. Software flow control uses special XON and XOFF char-

acters to communicate between your computer and the modem. Hardware flow control is the preferable (and default) method because of its speed and reliability.

To use hardware handshaking flow control, you must have:

- Hardware handshaking cable (if your modem is external) such as the one that may have been provided with the modem.
- Hardware (RTS/CTS) flow control enabled in your telecom software. If your modem came with telecom software, the software should have flow control enabled.
- Flow control enabled by the **&K3** command (RTS/CTS hardware flow control). **&K3** is the factory default with most modems.
- **DTR** disabled (**&DØ**) if you are using a Macintosh. **&DØ** is the factory default with most Macintosh modems.

The Configurations Most People Need

Simply issue **AT&F1** (if you have a Macintosh) or **AT&F2** (if you have any other type of computer). Then issue **AT&W** to store the configuration so it loads automatically when you turn on the modem. This tells your modem to use AutoReliable mode, hardware handshaking, and **CONNECT XXXX** messages that reflect the computer's rate. Chapter 8 provides more information.

Using Xmodem, Ymodem, or Pre-Compressed Files

MNP 5 Data Compression

We recommend disabling MNP 5 data compression (**%C**) when using an MNP Reliable connection and transferring files that are already compressed by compression software such as ARC, ZIP, or StuffIt. When files compressed by these programs are transferred using MNP 5, the files sometimes actually take longer to transfer than files transferred using a Reliable connection without data compression.

V.42bis Data Compression

V.42bis is more sophisticated than MNP 5. When it recognizes that there is no benefit to compressing software-compressed data further, it

does not attempt to use V.42bis compression. To receive this and other benefits, use V.42bis rather than MNP 5 whenever possible.

Error Correction

Unlike data compression, it is usually advantageous to use MNP 2-4 or LAPM error correction for ANY file transfer, regardless of compression or software-based error correction protocols such as Xmodem, Ymodem, etc. The error correction protocol strips start and stop bits from each character (improving throughput) and performs error correction on smaller chunks of data than do software-based error correction protocols (so if an error does occur, less data has to be retransmitted, taking less time).

5

Dialing

Most of the time you'll use your telecommunications software to dial numbers, and you'll be able to mostly ignore this chapter. But at some point you may need to tell your software something it does not inherently know, or you may need to set your modem in some way that your software can't do for you. This chapter tells you what you need to know in situations like these.

Refer to your software manual for instructions on using your software to dial numbers and answer calls.

Using the Dial Command

Your modem dials phone numbers when you give it the dial command (**ATD**) and a phone number, either alone or with dial modifiers.

The phone number must be an ASCII string containing the characters Ø through 9 (for pulse dial lines) or those numbers and A, B, C, D, #, and * (for touch-tone dial lines). The number cannot exceed the size of the command buffer (250 characters excluding the AT prefix, spaces, the carriage return control character, and the line feed control character).

The modem uses the dial command modifiers (listed below) in the order it encounters them on the command line, from left to right.

L dial last string dialed

P pulse dial

Sx dial number stored in memory location x (x=Ø, 1, 2, or 3)

T touch-tone dial

W wait for dial tone before processing the next character in the dial string (useful for PBX phone systems)

@ wait for five seconds of silence before continuing

, pause before processing the next character in dial string

! hook flash (go on-hook for 700 ms.)

^ turn on calling tone if originating call (enabled on a call-by-call basis only)

; return to command state after dialing
(must be last character in the command line)

To aid readability, spaces, hyphens, and parentheses can be added to the dial command line without affecting its function.

In the following example, your modem goes off-hook, waits for a dial tone, and then touch-tone dials the number 1 (405) 555-9624.

AT DT 1 (405) 555-9624 [CR]

If your modem does not receive a valid carrier from the remote modem within 50 seconds (the default value of register S7), your modem hangs up and sends the **NO CARRIER** result code. If the modem does receive a valid carrier within the time allowed, it sends a **CONNECT XXXX** message indicating the connection rate.

Dialing from a Telephone

You can also dial a number yourself on a telephone and give the modem a command that tells it you want to connect to another modem. The modem offers two ways to do this.

The first method lets you call a remote modem that is set to auto answer. It is to be used in situations where you will not talk to a person before the modems connect. When you have a choice, we recommend simply using the modem to dial the number, instead of using this method. If you need to use this method, follow these steps:

1. Type the following but DO NOT press the carriage return:

   AT X3 D

2. Dial the number yourself on the telephone.
3. When you hear a carrier, press the carriage return **[CR]** and hang up your telephone. Your modem tries to connect with the remote modem.

The second method lets you talk to someone on the phone and then connect modems without hanging up. To do this, follow these steps:

1. Talk to each other using telephones plugged into the **PHONE** jacks on the backs of your modems.
2. When you're done talking and you're ready to start using the modems, *DO NOT* hang up your telephone receivers.
3. *One of you:* Type **ATA [CR]**.

   The other one of you: Type **AT X3 D [CR]**. You'll both hear a high-pitched squeal from your modem speakers (if they're turned on). Then you should both see a **CONNECT** result code appear on your screens.
4. Hang up your phone receiver, and you are online. When you're done, hang up the modems through your software or by issuing the escape code (**+++**), followed by the **AT H** command.

Storing a Telephone Number

You can store up to 4 frequently called phone numbers in your modem's memory by using the **&Z*x*=*n*** command, where ***x*** is the modem's memory location and ***n*** is the number to store (which cannot exceed 36 characters). The value in *x* can be Ø, 1, 2, or 3, with *x*=Ø the default.

For example, this saves tone-dialed number T555-9624 in location 1:

AT &Z1=T555-9624 [CR]

Dialing a Stored Telephone Number

To dial a stored number, use **D** with the **S*x*** modifier. This command dials the number stored in memory location ***x***. For example, the following command dials the number in memory location 1:

AT DS1 [CR]

Automatic Pulse Dialing

If your local telephone system does not support touch-tone dialing, the way your modem acts depends on how it is configured.

If your dial string includes the **P** dial command modifier OR you have previously issued the **P** command, the modem will pulse dial.

If your dial string includes the **T** dial command modifier OR you have previously issued the **T** command, the modem will tone dial.

If your dial string does not include a **P** or **T** dial command modifier AND you have previously issued the **T** command, the modem does the following:

1. Listen for dial tone. (Note that changing the **X** command from its default can affect this step.)

2. Tone dial the first digit in the dial string.

3. Wait up to 3 seconds for the dial tone to end.

4. If the dial tone ends, the modem continues dialing.

   If the dial tone does not end, the modem knows your phone system can only handle pulse dialing (because the phone system did not process the tone-dialed first digit). So it switches to pulse mode, pulse dials the first digit, and then pulse dials the rest of the number.

Note that this feature can cause problems with PBX systems — for example, systems where a 9 is dialed to get a dial tone outside a company's in-house phone system. Such systems deliver a second dial tone after receiving the first digit.

Disabling Call Waiting

If you have Call Waiting, we recommend that you disable it before using your modem. If you don't disable it and a call comes in while you are online, you will either lose data or be disconnected. Please refer to your local telephone book or phone company for directions on how to do this. In many locations, you can disable call waiting by placing ***71** or ***70** (followed by a comma to pause the dialing command for two seconds) in the dial string, either just before or after the number you are dialing. For example, you might use:

AT DT *71, 555-0000 [CR]

Call waiting usually resumes immediately after you hang up, so you have to do this on each call. If your software has a built-in dialing prefix (or macro) you can probably include this code so it is used on every call.

6

Answering

Your modem can answer telephone calls and (with help from your telecommunications or fax software) manage those calls appropriately. Under certain conditions, the modem can also tell you who is calling, before the call is answered.

Your fax and telecom software should be able to handle most answering tasks. However, because some of the modem's capabilities are relatively new, a thorough understanding of the answering process will help you set up your software and modem for optimal performance. This chapter is designed to give you that understanding as well as to explain the basic techniques for answering incoming telephone calls. (For more information on your software, refer to your software manuals.)

Answering Calls

Your modem provides three ways to answer calls:

- You issue the **ATA** command when you detect an incoming call. This makes the modem answer the call immediately. The modem goes online when it detects a carrier.
- You talk on a phone and then connect modems. This is described in Chapter 5, "Dialing From a Telephone."
- You set your modem to auto answer. In this case, your modem automatically answers all incoming calls. The rest of this section explains how to use auto answer.

Your modem answers calls automatically (auto answer) if you set register **SØ** to a value from 1 to 255. This value is the number of rings the modem waits before it answers the call. The following example sets the modem to answer calls after the second ring:

AT SØ=2 [CR]

If you set the modem to auto answer and your modem shares a line with a telephone, the modem may answer calls before you can intercept it. Be careful with auto answer unless you have a dedicated modem phone line. By default, auto answer is disabled.

On some modem models, if you set the modem to auto answer, the modem displays the **AA** message until the modem detects a ring signal. Then when the modem does detect a ring, the **RI** message is displayed for 2 seconds.

If you plan to connect your modem directly to a mainframe or mini-computer where it will be dedicated to auto answer operation, you *might* need to change the modem's configuration from its defaults. Because every situation is different, it's hard to say what you'll need to change. First try the **Q1** command. If **Q1** doesn't solve the problem, also try **&D**, and if there's still a problem, also try **&C**. Please call Technical Support if you need assistance.

If you plan to use your modem to run a Bulletin Board System (BBS), the BBS software should automatically configure it for auto answer operation. If you think that you need to change it, refer to your BBS software manual or contact the BBS software publisher for details on how your modem should be set.

Caller ID (Optional Feature #142)

Caller ID (optional feature #142) is not available on all modem models. The **I10** command reports which optional features your modem supports.

What is Caller ID?

Caller ID is a way for you to find out who is calling before you answer a telephone call. In between the first and the second ring of an incoming call, the phone company sends information such as:

- the date and time of the call
- the phone number from which the call originated
- possibly a name associated with that phone number

The information displayed varies depending on your phone company and your software.

Potential Applications

Caller ID can be used by many computer applications for improved security, efficiency, and convenience. Here are a few of the potential applications:

- Bulletin Board Systems (BBSs).

  A BBS can positively identify callers without the normal tedious logon sequences, and prevent unauthorized entry due to lost or stolen accounts and passwords.

- Screening Calls.

  Your computer can display the number and possibly name of who is calling, so you can decide if you want to answer or not.

- Professional billing.

  Your computer can match incoming calls to your client list and automatically create a charge to the client's account for your phone time.

- Database Lookup.

  Your customer's record or account can be displayed on your computer screen before you answer the call.

Your ability to take advantage of these applications (and others) depends on your software.

Can You Use Caller ID?

To use the modem's Caller ID feature:

- Your local telephone company MUST provide Caller ID, and it must be enabled for your telephone line.

  At present, Caller ID is only available in some areas of the country. If your phone company does not offer Caller ID, you cannot use your modem's Caller ID feature. To find out if Caller ID is available in your area, contact your local telephone company.

- You MUST have software that allows you to use Caller ID.

  The "Software Options" section in this chapter explains software requirements.

- Your modem's Caller ID feature must be turned on.

The "Caller ID AT Commands" section in this chapter provides more information.

Software Options

The degree to which you can take advantage of Caller ID depends on your software:

- Incoming Data Calls

  At present, most people use telecommunications software to take advantage of Caller ID. If configured to do so, when the modem receives an incoming call, it displays the call information in the telecom software's terminal mode screen. After reading the information displayed in your telecom software, you can either let your modem answer the call or you can answer the call yourself using a telephone handset. The "How to Use Caller ID with Telecommunications Software" section in this chapter provides more information.

- Incoming Fax Calls

  To use the Caller ID feature with incoming fax calls, your fax software must support Caller ID. If your fax software does, refer to your fax software manual to learn how to use this feature.

- Additional Applications

  Many widely used BBS programs now support Caller ID.

Caller ID AT Commands

The following AT commands enable and disable Caller ID:

#CID=Ø Disables Caller ID.

#CID=1 Enables Caller ID in a readable format.

#CID=2 Enables Caller ID as ASCII printable characters in hex format .

How to use Caller ID with Telecommunications Software

As with any AT data commands, you can issue the Caller ID commands from your telecommunications software terminal mode, or include them in your telecom software's initialization string. Other

software that supports Caller ID will probably issue these commands automatically.

The following steps explain how to use telecommunications software to take advantage of Caller ID.

1. Read the "Can You Use Caller ID?" section earlier in this chapter.

2. Start your telecommunications software and make sure it is in terminal mode.

3. Configure your modem for Caller ID by typing the following commands in your software's terminal mode. As an alternative, you can include the commands in your telecom software's init string. **[CR]** represents a carriage return.

   a. Enable the modem's Caller ID feature.

      AT #CID=1 [CR]

   b. Make sure no other devices (such as your modem, answering machine, or fax machine) answer before the second ring. You do not have to have your modem in autoanswer mode to have Caller ID work. For example, you can set your modem to answer on the third or later ring, as shown below. (The phone company sends the Caller ID information between the first and second ring of an incoming call.)

      AT SØ=3 [CR]

   c. If you want to skip step 3 in the future, issue the following command to save the above commands in your modem's nonvolatile memory.

      AT &WØ [CR]

4. Now the modem is ready to receive an incoming call. When a call comes in, the telecom software's terminal mode screen reflects the modem's activity. It looks something like this:

   RING

   DATE = 0321

   TIME = 1405

   NMBR = 5039672400

NAME = ANYCOMPANY

RING

Here is an explanation of this display:

- The first **RING** result code appears when the modem receives the first ring signal (equivalent to a telephone ringing once).
- The next four lines represent the Caller ID information, which the phone company sends in between the first and second ring of an incoming call.

  The actual information displayed varies depending on your phone company. For example, the date and time may be displayed in different locations, and the "name" might not be included.

  Also, some extraneous characters might be included. For example, several customers have told us that in parts of Canada, in place of single spaces the number "30" is displayed. This is due to the use of a different Caller ID format than we recognize.
- The second **RING** result code represents the second ring signal the modem receives.

5. If you recognize the phone number or name displayed in step 4, you may be able to determine if the call is voice or data.

6. Now do one of the following:
   - If the call is from a person (a "voice call"), pick up the telephone handset and answer the call yourself.
   - If the call is from another modem (a "data call"), let your modem answer the call automatically. If the modem answers the call, you then see a **CONNECT** result code (or whatever message your software displays upon receiving a **CONNECT** result code).

Silent Answer (Optional Feature #141)

Silent Answer (optional feature #141) is not available on all modem models. The **I10** command reports which optional features your modem supports.

What is Silent Answer?

Silent Answer is a feature that enables your modem to receive fax and voice calls on the same telephone line. Silent Answer can reduce your telephone line costs by eliminating the need for dedicated fax and voice lines. And since it handles your incoming calls for you, you don't need to be present to receive messages and faxes.

The steps that follow give a general explanation of how Silent Answer operates with an answering machine.

1. Your phone/fax line starts ringing.
2. After a specified number of rings, your answering machine picks up the line.
3. The modem starts silently "listening in" on the line, waiting for fax CNG tones.
4. If the modem detects fax CNG tones, it picks up the phone line and receives the fax. The answering machine detects that the modem has picked up the line, and switches off.
5. If the modem does not detect fax CNG tones, it does nothing and the call goes to the answering machine without interruption.

Since Silent Answer is relatively new, state-of-the-art technology, some people find they need to experiment before Silent Answer works well for them. If you have problems with Silent Answer, see the trouble-shooting information provided in Chapter 9.

Using Silent Answer

Before performing these steps, read through the entire procedure to make sure that you have everything you'll need.

1. Connect your modem to your computer and install fax software as explained in your *Getting Started* manual.

2. Be sure your modem supports Silent Answer. To find out if your modem has Silent Answer, issue the **AT I10** command from your telecommunications software terminal mode. This displays a list of numbers. If the number **141** appears in the list, your modem supports Silent Answer. If the number **141** does not appear in the list, your modem does not support Silent Answer.

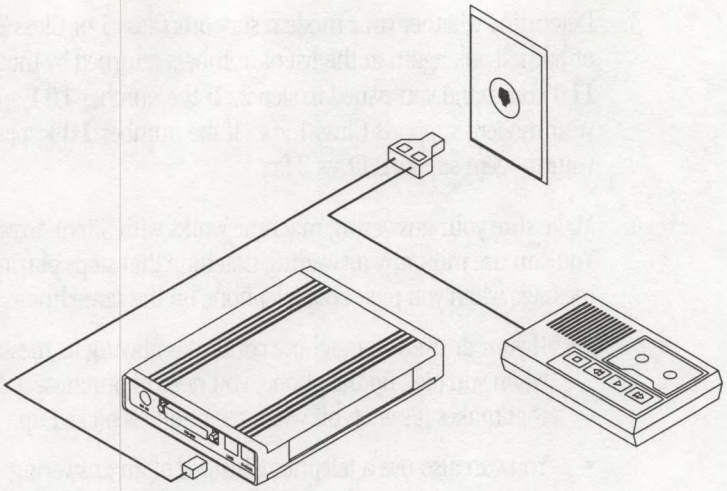
3. Determine whether your modem supports Class 1 or Class 2 fax, or both. Look again at the list of numbers returned by the **AT I10** command you issued in step 2. If the number **101** appears, your modem supports Class 1 fax. If the number **104** appears, your modem supports Class 2 fax.

4. Make sure your answering machine works with Silent Answer. You can use most any answering machine that stops playing its message when you pick up a telephone on the same line.

    - If your answering machine continues playing its message when you pick up the phone, you need to purchase a device that makes it switch off when the phone is picked up.
    - You can also use a telephone instead of an answering machine; this may be helpful if you want to be able to pick up the receiver and listen for an incoming fax CNG tone. Once you hear your modem respond to the CNG tone with its own high-pitched tones, hang up your phone.
    - Silent Answer will not work with electronic voice mail.

5. Connect your answering machine and modem to the phone line. The modem and answering machine cannot be connected to each other.

    - You can plug your answering machine and modem into different phone jacks (i.e. in different rooms), or a "Y" splitter can be used to connect the modem and answering machine to the same phone jack.
    - The diagram below shows how to connect your answering machine and modem (or telephone and modem) using a Y splitter.



- You can also connect your answering machine and modem to different phone jacks on the same phone line (i.e. in different rooms).
- If you use a telephone instead of an answering machine, do not plug the phone into the modem. The telephone should be connected to a separate phone jack, just as you would connect the answering machine.

6. Prepare your answering machine message. The first two or three seconds of your answering machine's outgoing message should be either very low volume or silent to allow for the modem's detection of an incoming fax tone. Do not put music on your message because music often has sounds that may be interpreted as fax CNG tones.

7. Turn off screen savers and possibly other software. Since faxes are a very timing-critical operation for your modem and computer, it's a good idea to turn off any screen savers you might be running. This includes the built-in Windows™ screen saver and third party programs such as After Dark™. Some TSR programs and disk compressors (like DoubleSpace™ or Stacker™) can also cause unreliable faxing.

8. Make sure your fax software supports Silent Answer. The following table shows some popular fax software your modem can

use and whether that software supports Class 1 or Class 2 fax drivers.

- Be sure that the software you choose supports the same fax driver that your modem supports. For example, if your modem only supports Class 1 and your software only supports Class 2, Silent Answer will not work.
- The software listed in the table below is known to support Silent Answer when used with the indicated fax drivers. For a current list of compatible software, we recommend calling the FaxBack System as described Chapter 10 of this manual.

COMPUTER	SOFTWARE	FAX DRIVER(S)
Macintosh	FAXcilitate 1.6 or later	Class 1
PC*	WinFax Pro 2.0, or 3.0 Windows™ 3.1 or later	Class 2
PC*	WinFax Lite or WinFax Pro 4.0 with Windows 3.1 or later	Class 1, 2
PC*	FaxTalk Plus 1.65c, FaxTalk Plus 1.70, FaxTalk for Windows 1.50	Class 1, 2

* To use Silent Answer in the Windows environment, you must have Windows 3.1.

9. Enable Silent Answer in your fax software. To do this, put the command that enables Silent Answer into your fax software initialization string. For detailed instructions on how to do this, refer to the upcoming section "Enabling Silent Answer."

10. Set your fax software to answer on two more rings than the answering machine. For example, if your answering machine answers on the fourth ring, set your fax software to answer on the sixth ring.

11. Leave your computer and fax software on. From now on, Silent Answer should take care of the rest.

Enabling Silent Answer

This section provides the detailed steps you need to follow to enable Silent Answer in the specific fax software you choose to use (such as Winfax or FAXcilitate).

ATTENTION — The instructions might tell you to add a command to your fax software initialization string. For example, if your initialization string is **AT&F1K4VE** and you need to add the Silent Answer command **+FAE=3**, your initialization string with Silent Answer enabled will read **AT&F1K4VE+FAE=3**.

You might need to refer to the following table while using these instructions. The table shows which command you must add to your initialization string.

	Class 1. Add the following to the end of the initialization string:	Class 2. Add the following to the end of the initialization string:
FAXcilitate 1.6 or later	FAXcilitate does not require a command to be added to the initialization string. Click on the Silent Answer checkbox in the fax hardware settings.	N/A
WinFax Lite WinFax Pro 4.0 with Windows 3.1 or later	+ FAE = 3	+ FAA = 2
FaxTalk Plus 1.65c, FaxTalk Plus 1.70, FaxTalk for Windows 1.50	+ FAE = 3	+ FAA = 2

FAXcilitate Version 1.6 or later (Macintosh)

1. Enable Silent Answer.
   a. **Select the Preferences** from the Fax Menu and use the scrollbar to find and select the **Fax Hardware** icon.
   b. **Click on the Silent Answer checkbox** so it is selected.
   c. **Set the number of rings.**
   d. **Close the FaxPreferences window**.
2. Silent Answer is now ready to use.

WinFax Lite and WinFax 4.0 (Windows 3.1)

1. Determine whether your software was installed as Class 1 or Class 2.
   a. Start Windows and launch your fax software.
   b. In WinFax, open the **HELP** menu and select **ABOUT**. WinFax tells you whether you've installed WinFax for Class 1 or Class 2.
2. Refer to the table "Fax Software that Supports Silent Answer" to determine the appropriate fax driver (Class 1 or Class 2) for Silent Answer.

   ATTENTION — If you choose to use Class 2 for WinFax 2.0 (or for older non-"Award-Winning" versions of WinFax Lite) make sure you have the most current Class 2 fax driver. To find out if your software has the current Class 2 driver for Silent Answer, click on **HELP**, then **ABOUT**, and check the release date of your software. If the release date is before November 1992, you need to download the latest Class 2 Supra driver from the IBM Files section of the Supra BBS in order to use Silent Answer. If your software is any release during or after November 1992, you do not need to download any additional files. The instructions in this section apply to both the older and newer WinFax Class 2 drivers. When using WinFax 4.0, change S7=55 to S7=90.

3. Enable Silent Answer by changing your initialization string.
   a. **Open** the Windows **Control Panel** and select **PORTS**.

b. **Choose the COM port** that your modem is using (either the COM setting for internals, or the serial port the modem plugged into for externals).

c. Under the Settings option, **change the baud rate to 57600** (you'll need to type it in).

d. **Select XON/XOFF** flow control. Close the Windows Control Panel.

e. **Start your fax software.** Select Fax, then Setup, then More.

f. At the end of the modem initialization string, **add +FAE=3** for Class 1, or **+FAA=2** for Class 2. DO NOT change anything else in the initialization string! Note that the \ character represents a carriage return. The \ character should be the last character in the string.

4. **Restart your fax software** to activate your changes.

FaxTalk Plus 1.65c or 1.7 (DOS)

A note about FaxTalk Plus: Some people have problems using FaxTalk Plus with Class 2. We recommend that you use FaxTalk Plus with Class 1 whenever possible.

1. Determine whether your software was installed as Class 1 or Class 2. To do this, **open the Configure** menu and look for your modem selection, this shows whether your software is installed as Class 1 or Class 2.

   a. **Class 1:** the **Configure** box lists a SupraFAXModem as your modem.

   b. **Class 2:** the **Configure** box lists **Generic Class 2** as your modem.

2. **Refer to the table "Fax Software that Supports Silent Answer"** to determine the appropriate fax driver (Class 1 or Class 2) for Silent Answer.

3. **Change your fax driver** if necessary. Follow the procedures below for FaxTalk Plus 1.65c and FaxTalk Plus 1.7.

   a. **Return to the DOS prompt.**

   b. **Type FINSTALL** and a carriage return.

c. **Go to Configure** and specify Class 1 or Class 2 as follows.

Class 1: Select your SupraFAXModem.

Class 2: Select **Generic Class 2** as your modem.

d. **Press F10** three times to return to DOS.

4. **Enable Silent Answer** by changing your initialization string.

a. Use the arrow keys on the keyboard to **select Config** from the menu at the top of the screen. Use a carriage return to enter the Config menu. The Config screen will open.

b. **Select System** and press the return key. Use the arrow keys to move the cursor to the Modem Init String box.

c. At the end of the modem initialization string in the box, **add +FAE=3** for Class 1, or **+FAA=2** for Class 2. DO NOT change anything else in the initialization string!

d. **Press F10** to save the new configuration. Press F10 again to return to the main FaxTalk menu.

e. **Press the Esc key** to exit FaxTalk and press the Y key when FaxTalk asks you if you want to exit.

5. **Run FaxTalk** again to activate Silent Answer mode.

FaxTalk for Windows

FaxTalk for Windows does not have a Supra Class 2 fax driver, we recommend using Class 1. All you need to do is enable Silent Answer.

1. **Enable Silent Answer** by changing your initialization string.

a. Open the Configure menu.

b. Click on Modem.

c. Change the initialization string.

d. Click on OK.

e. Press the Esc key to exit FaxTalk and press the Y key when FaxTalk asks you if you want to exit.

2. **Run FaxTalk** again to activate Silent Answer mode.

Silent Answer Plus (Optional Feature #154)

Silent Answer Plus works just like Silent Answer, except that Silent Answer Plus also listens for data tones in addition to CNG tones. Calling tones are higher than CNG tones and have a different cadence.

To turn Silent Answer Plus on, give the command **AT+FAE=4** for Class 1 faxes or **AT+FAA=4** for Class 2 faxes.

If a CNG tone is detected, your modem answers the telephone prepared to receive a fax. When a calling tone is detected, the modem answers the telephone prepared to receive data. So, a modem and an answering machine can handle fax, data, and voice calls.

Adding Calling Tones to Your Data Calls

If you want to send data to a modem that you know is using Silent Answer Plus, you can add calling tones by including a '^' in the dial string. This causes your modem to generate a calling tone after it dials and before it connects.

Adaptive Answer

What is Adaptive Answer?

Adaptive Answer lets your modem determine if an incoming call is a fax or data call and handles the call appropriately.

With Adaptive Answer ENABLED, and Silent Answer DISABLED, the following is what happens when the modem receives an incoming call.

1. The telephone line starts ringing.
2. The modem answers the call.
3. If the modem detects fax "CNG" tones, the modem, fax software, and computer handle the fax call.
4. If the modem does not detect fax tones, it assumes the call is a data call. It sends a data carrier and waits for the remote modem to try to connect.
5. If a remote modem responds, the modems try to connect.

6. If no remote modem responds, the modem hangs up.

If Silent Answer and Adaptive Answer are both ENABLED, Silent Answer takes precedence.

Setting Up Adaptive Answer

Adaptive Answer can be set up for either Class 1 faxes or Class 2 faxes. To set up Adaptive Answer for Class 1 faxes, use the command **AT+FAE=1**. For Class 2 faxes, use the command **AT+FAA=1**.

To operate effectively, your modem needs to be reset with **ATZ** between each call. A sample initialization string might look like this:

ATZ

AT&F2+FAE=1

Can You Use Adaptive Answer?

To use Adaptive Answer, you must have software that supports it. The software that comes with your modem does not.

7

Connecting

A connection begins after one modem answers a call from another modem, and ends when either modem disconnects. Because of "negotiation," the process of making a connection might take several seconds after dialing. Chapter 4 explains negotiation.

Bell & ITU-TSS Protocols

Your modem supports the following communications protocols: Bell 103, Bell 212A, ITU-TSS V.21, ITU-TSS V.22, ITU-TSS V.22bis, ITU-TSS V.23, ITU-TSS V.32, ITU-TSS V.32bis (optional feature #140), V.FC (optional feature #147), and ITU-TSS V.34 (optional feature #153). These protocols define the basic communications link between the two modems — that is, the frequency of the tones they use and how they modulate the data. These protocols are completely separate from the error correction and data compression protocols. The exact protocols that you use are determined by the type of modem you are connecting to.

For 300 bps and 1200 bps connections, there is one set of protocols used in the U.S. and Canada and another used in most of the rest of the world. The U.S. protocols are Bell 103 (300 bps) and Bell 212A (1200 bps) — named after the AT&T Bell Labs that developed them. For Europe, and much of the rest of the world, the protocols adopted by the ITU-TSS (an international standards committee) are used: V.21 (300 bps), and V.22 (1200 bps). You will probably only use one set of these protocols, unless you make international calls.

At 2400 bps through 14,400 bps connections, ITU-TSS protocols are used everywhere:

Protocol	Speed
V.22bis	2400 bps
V.32	4800 bps 9600 bps
V.32bis	4800 bps 7200 bps 9600 bps 12000 bps 14400 bps

The V.FC protocol defines speeds from 14,400 bps through 28,800 bps. V.FC is a method for achieving these high speeds that was accepted world wide by many modem manufacturers prior to the establishing of V.34. The speeds supported by V.FC are:

14,400 bps
16,800 bps
19,200 bps
21,600 bps
24,000 bps
26,400 bps
28,800 bps.

The V.34 protocol was established by the ITU-TSS and defines speeds from 2400 bps to 28,800 bps. Speeds supported by V.34 are:

2400 bps
4800 bps
7200 bps
9600 bps
12,000 bps
14,400 bps
16,800 bps
19,200 bps
21,600 bps
24,000 bps
26,400 bps
28,800 bps

Connection Rates

Chapter 4 explains how error correction and data compression affect connection rates.

Connection Types

All Normal and Reliable connections take advantage of flow control, which allows your computer and modem rates to be different. With Direct connections, these rates must be the same.

You can only use data compression if you have made an error correcting (MNP or LAPM) connection with another modem that supports data compression. MNP 5 is only used with MNP error correction, and BTLZ is only used with LAPM error correction. If a data compression connection cannot be made, or if data compression has been disabled, only error correction is attempted.

The table on the following page shows the types of connections possible between two modems like yours. Chapter 4 provides more information.

Answering Modem Set To:	Originating Modem Calls At:					
	Normal \N	**Direct \N1**	**Reliable \N2**	**Auto-Reliable \N3**	**Reliable \N4**	**Reliable \N5**
Normal \N	Normal	Direct or Normal	hangs up	Normal	hangs up	hangs up
Direct \N	Normal or Direct	Direct	hangs up	Normal or Direct	hangs up	hangs up
Reliable \N2	hangs up	hangs up	MNP	MNP	MNP	MNP
Auto-Reliable \N3	Normal	Direct or Normal	MNP	LAPM or MNP	LAPM or MNP	MNP
Reliable \N4	hangs up	hangs up	LAPM	LAPM	LAPM	MNP
Reliable \N5	hangs up	hangs up	MNP	MNP	MNP	MNP

8

Custom Modem Configurations

Do You Need to Configure Your Modem?

Before your modem left the factory, it was set up to act a certain way; for example, it returns full-word result codes and waits for a dial tone before dialing. These settings work for most situations, but in some circumstances, you may need to change your modem's default configuration — like if you want to change the speaker volume setting. This chapter tells how to do that.

Factory Default, Active, & Stored Configurations

There are three types of modem configurations:

- The "factory default configuration" is stored in the modem's permanent memory (called firmware ROM). There are 3 different factory configurations, depending on what kind of computer you are using and if you need error correction and data compression.
- The "active configuration" is the configuration you're using when you have your modem turned on. It is stored in the modem's temporary memory (called temporary RAM).
- If you save the active configuration, it becomes a "stored configuration" that resides in the modem's nonvolatile RAM ("novram").

Whenever you turn on your modem, it loads a stored configuration from nonvolatile memory into the active configuration area. If you don't save your active configuration, it will be lost when you turn the modem off.

Creating a Custom Configuration

You can create a custom configuration by changing the settings that comprise the active configuration. The modem's AT commands let you change most of these settings by issuing single commands. Occasionally, you may need to change a setting by issuing the ***Sr=n*** command, which changes low-level **S** registers.

AT Commands Used When Creating a Custom Configuration

You can use a number of different AT commands to change settings, including the following commands, which are particularly useful. Be sure you understand Chapter 2 before using AT commands. Appendix B explains AT commands in detail.

- **&FØ**, **&F1** and **&F2**, which reset the active configuration to preset factory default configurations. *The &F1 (Mac) and &F2 (PC) configurations meet most user's needs best.*
- **&V**, or **\S** (optional feature #146), which display configurations. The **I10** command reports which optional features your modem supports.
- **&W*n*** (where n is profile Ø or 1), which saves your active configuration in the modem's nonvolatile RAM.
- **Z*n*** (where ***n*** is profile Ø or 1), which resets the modem and loads the stored configuration from profile Ø or 1.
- **&Y1**, which causes the stored configuration from profile 1 to be loaded into the active configuration area when you turn on or reset your modem. If you do not issue **&Y1**, the configuration from profile Ø is loaded instead.

AT Commands for Changing S Registers Directly

S*r*? displays the value in register ***r***. For example, **ATSØ?** reads S register Ø and displays three digits — ØØ5 if the value is 5. Appendix D describes your modem's S registers.

S*r*=*n* sets the value in S register ***r*** to ***n***. The ***n*** must be a decimal integer from Ø to 255. For example, the command **ATSØ=4 [CR]** sets register **SØ** to 4, which causes the modem to automatically answer all incoming calls after the fourth ring. The modem replies with **OK**.

&F, &F1, &F2: The Factory Configurations

The following commands load the factory default configurations:

&F Load basic 9600 or 14,400 bps configuration, with error correction and data compression disabled. This command includes **\N1 &KØ &QØ &D2**. Use this configuration if your telecom software or modem cable does not support hardware handshaking (regardless of your computer type). In this case, you will not be able to use data compression or error correction.

&F1 Load Macintosh error correction/data compression configuration. This command includes **\N3 &K3 &Q5 &DØ**. This is the configuration needed by most Macintosh computers, except those using either telecom software that does not support hardware handshaking or a cable that does not support hardware handshaking.

&F2 Load IBM (and others) error correction/data compression configuration. This command includes **\N3 &K3 &Q5 &D2**. This is the configuration needed by most computers, except Macintosh computers and any computer using either software or a cable that does not support hardware handshaking.

The settings included with **&F**,**&F1** and **&F2** do the following:

\N1 Direct Mode. Makes your modem act just like a regular modem that doesn't support error correction or data compression.

\N3 AutoReliable connection. Makes the fastest possible connection and uses the best possible error correction and data compression.

&K Disable flow control.

&K3 RTS/CTS hardware flow control. Allows you to use data compression and error correction.

&Q Asynchronous Direct mode.

&Q5 Asynchronous error correction mode.

&DØ, &D2 Selects correct DTR settings so hardware handshaking flow control will work.

9

Solving Problems

This chapter is designed to help you solve most telecommunications problems. The general structure of the chapter is:

- symptoms exhibited
- possible sources of the problem
- potential solutions

To use the trouble-shooting information, follow these steps:

1. Try the suggestions in "Double Check Your Equipment & Configuration."
2. Scan the headings and bullets (•) in the rest of this chapter until you find the bullet that lists the symptoms of the problem you are having. The potential problems are divided into six sections:
   - problems encountered while offline
   - problems when trying to connect
   - problems while connected
   - problems with high-speed connections
   - problems with Silent Answer
   - miscellaneous problems
3. Note the potential sources.
4. Try the solutions that seem most appropriate. If you're not sure, try each suggestion in order.

Double Check Your Equipment & Configuration

Before doing anything else, try completely disconnecting and then reconnecting the modem as explained in the *Getting Started* manual. (For

your modem and many other electronic products, this solves common problems that are caused by incomplete connections.)

Also try using **&FØ**, **&F1**, and **&F2** to return the modem to one of the factory default configurations (as explained in Chapter 8). This may fix problems caused while trying to re-configure the modem. If you continue to have problems, try using the potential solutions given in the rest of this chapter.

Problems Encountered While Offline

The *Getting Started* manual provides additional information.

- If you have an external modem and the modem appears not to have power, make sure you are using the power adapter that came with your modem (9 VAC) and that the modem is plugged into a working power outlet. If this is OK, press the **POWER** button once or twice, leaving the modem off for at least 30 seconds before turning it back on. If the modem still does not have power, disconnect it from your computer and press the **POWER** button once or twice again. If the modem turns on, the problem is with your computer's serial port or your RS-232C cable; contact your computer dealer for assistance. If the modem does not turn on, the problem is with the modem or power supply; contact Technical Support for assistance.
- If your computer is not sending data to your modem, as determined with the **SD** or **RD** light on some modem models, one of the following is probably the reason.
  - The modem and computer are not connected properly. Check the connections, and make sure the RS-232C cable is plugged into the correct computer port. Also make sure that the data is going to the correct serial port. Your computer may have other serial ports for your printer, mouse, and other peripherals.
  - The RS-232C cable is damaged or the wrong type for your computer. Get a working cable from your dealer or Supra.
  - Your computer's serial port is not working properly. Contact your local computer dealer for assistance.
  - Your software is not working properly. Refer to your software manual for assistance.
  - Your modem is not working properly. Contact Technical Support for assistance.

- Your software is not set up correctly. Ensure it is set for the correct port.

- If you have an IBM PC or compatible and your software does not recognize the modem, one of the following is probably the problem:
  - You have more than one piece of hardware assigned to the same COM port or IRQ. Make sure only one device is assigned to each COM port.
  - The COM port selected in your software is different than the COM port selected on the modem board (internal modems only). Make sure the COM port selected in your software is the same as the COM port selected on the modem board. The *Getting Started* manual provides more information.
- If what you type does not appear on the screen, enable command echo by issuing the **E1** command; then issue the **&W** command. Alternatively, you may be able to turn on Local Echo in your software.
- If two letters appear on the screen for every one you type while in the command state, disable command echo by issuing the **E** command or clearing the Local Echo option checkbox in your software.. You can also solve this problem by using your telecommunications software to change your computer setting to Full Duplex Operation.
- If you type **AT** followed by a carriage return and the modem does not acknowledge it with the **OK** result code, one of the following may be the problem.
  - You are not in the command state. Enter the escape code (**+++**) to switch from online state to command state.
  - Your computer is set to a rate other than 300, 1200, 2400, 4800, 9600, 19,200, 38,400, 57,600, or 115,200. Use your software to change your computer rate to one of these rates.
  - Result codes may be disabled. Issue the **Q** or **&F**, **&F1**, **&F2** command, and then issue the **&W** command.
  - Your computer's serial port is not working properly. Contact your local computer dealer for assistance.
  - Your modem is not working right. Contact Supra.
- If you type **AT** followed by a carriage return and the modem returns a **Ø**, your modem is set to use numeric result codes instead of verbose result codes. Issue **&F**, **&F1**, or **&F2**, or issue **V1** and then **&W**.

- If your modem utilizes Flash ROM technology and suddenly stops responding, or if it doesn't respond when you turn it on, a Flash ROM error may have occurred. Try to flash the ROM as described below. If your modem still doesn't work, something else may be affecting it. Go through all of the steps listed here before calling.

  If an external modem has a Flash ROM error, it displays the following symptoms in most (but not every) instances:

  - the modem stops responding, the alphanumeric display goes blank,
  - the TR light comes on,
  - the RD light flashes rapidly, and
  - the SD light flashes occasionally.

  An internal modem will be working well then suddenly stop responding to your software or commands and display a series of arrows and exclamation points on the screen. Your modem continues this display until you reset it.

  If your modem has a Flash ROM error, it has gone into Flash Mode and is expecting new ROM code. Due to the nature of Flash ROM technology you may experience times when your modem slips into Flash Mode for no apparent reason. However, a Flash ROM error may occur most often just after you:

  - turn your modem on,
  - turn your modem off then on again rapidly, or
  - there is a power fluctuation.

  To reset your modem, run the flasher utility software provided on the diskettes that came with your modem.

  If you have a PC, run the flasher utility provided on the COMit disk (a:\flash\flasher.exe) that came with your modem.

  If you have a Macintosh, run the flasher utility provided on the Supra Data Software Disk 2 that came with your modem.

If you don't have the flasher utility, you can use another modem to download the flasher utility from the Supra BBS (503-967-2444), CompuServe (GO SUPRA), eWorld (shortcut=supra), or our Internet FTP site (FTP.SUPRA.COM).

Problems When Trying to Connect

Chapters 5, 6, and 7 provide additional information on dialing, answering, and connecting, respectively.

- If either you get a **NO DIALTONE** result code or you cannot get your modem to dial, one of the following may be the problem:
  - Your telephone line is plugged into the wrong jack. Make sure that your telephone line is plugged into LINE and your (optional) telephone is plugged into PHONE.
  - You have too many devices on the line. Try unplugging any other phone devices connected to your phone line.
  - Your PBX does not support modems. Your PBX system must be equipped with standard analog lines for your modem.
  - Your modem may not recognize the dial tone if you are overseas
  - Your modem may have suffered damage from a recent power surge or an electrical storm. Contact technical support.
- If you are having trouble connecting and you suspect the remote modem might be causing the problem, read the section called "Compatibility With Other Modems/Older Modems" later in this chapter.
- If you can get a dial tone but can't connect, you may not have the correct power supply. See the "Power Supplies" section later in this chapter.
- If you can send AT commands to your modem (you'll see the **OK** result code after typing **AT [CR]**) but you can't get a dial tone, you may not have the correct power supply. See the "Power Supplies" section later in this chapter.
- If you can only connect when the modem volume is low, you may not have the correct power supply. See the "Power Supplies" section later in this chapter.
- If you are having trouble making a Reliable connection, one of the following may be the problem:

- Your modem is not set to make a Reliable connection. Issue **&F1** (Mac) or **&F2** (IBM), or issue **\N2**, **\N3**, **\N4**, or **\N5**. Chapter 8 provides more information on these commands.
- The remote modem does not support MNP or V.42. A Reliable connection is not possible in this case.
- The remote modem supports MNP or V.42, but it is not in Reliable mode. Have the remote modem operator change to Reliable mode.
- The remote modem supports MNP or V.42 and either gets confused by the length of time your modem takes to "negotiate" the connection or confuses negotiation characters with the remote computer's log-in sequence. In this case, try using **\N** (Normal) to disable error correction and data compression and then try it again.
- The telephone line quality is so poor and noisy that it interferes with the negotiation process. A variety of factors can cause line noise. Refer to the "Line Noise" section in Chapter 3 to determine the source of the problem. You can also try to make a Normal connection instead.

- If your modem is not recognizing busy signals, or if your modem is interpreting other signals from the remote location as busy signals, please contact Technical Support for assistance.
- If you cannot connect and none of the other issues listed here seem to be the problem, refer to Chapter 3. The problems may be related to high-speed communication issues which are discussed in detail in that chapter.

Problems While Connected

Chapter 7 provides additional information on modem connections.

- If you have connected to a remote modem but your computer has frozen up or all you see on your screen are garbage characters, one of the following may be the problem:
  - If you are using a Macintosh and flow control, you may have the wrong cable. Refer to Chapters 3 and 4.
  - Line noise could be causing the problem. Refer to the "Line Noise" section in Chapter 3.
  - You have made a Direct connection, and your computer and modem are using different rates because the modem connected at a

different rate than it was originally set to. Use your software to change the computer rate so it matches the connection rate given in the **CONNECT** result code and try connecting again.

- Your computer and the remote modem are set to different data bits (word length), parity, and number of stop bits. The most common are 8 data bits (8-bit word length), no parity, and 1 stop bit (8, none, 1). Change these settings in your software to match the remote computer's settings.
- You have selected hardware or software flow control on the modem (using **&K3**, **&F1**, or **&F2** for hardware flow control or **&K4** for software flow control), but not in your software. Both your hardware and software must be set to use the same type of flow control. If your software does not let you turn flow control on and off, it either handles flow control automatically, or it does not support flow control. If your software does not support flow control, you probably cannot use Reliable or Normal connections. In this case, either obtain software that supports flow control, or disable flow control by issuing the **&KØ** command.
- Your modem cable is not working properly or does not support hardware handshaking. Refer to the "Flow Control & Hardware Handshaking Cables on External Modems" section of Chapter 3.
- Your computer's serial port is not working properly. Contact your local computer dealer for assistance.
- Your modem is not working properly. Contact Technical Support for assistance.
- You are using the Bell 103 (300 bps) protocol to make a 300 bps connection with one or both of the modems set to 1200 or 2400 bps. See Chapter 7 for information on how to do this.

- If your online communication is very slow and you are using error correction (and the **TE** or **RE** message is displayed on modems that support these messages), it may be that you are getting lots of transmission errors on a very noisy phone line (with lots of static, like you can hear on a voice phone sometimes). In this case, the modem has to continually resend data, slowing your actual throughput. To solve this problem, try hanging up and reconnecting. Refer to Chapter 3 for more information.

- If you can connect but then can't communicate with the remote modem, line noise could be causing the problem. Refer to the "Line Noise" section in Chapter 3.
- If you can connect but then the modems disconnect for no apparent reason, line noise could be causing the problem. Refer to the "Line Noise" section in Chapter 3.
- If you can connect but then the modem speed drops unexpectedly, line noise could be causing the problem. Refer to the "Line Noise" section in Chapter 3.
- If you are using a Macintosh and, when transferring data, the modem suddenly disconnects from the remote computer and displays the **OK** result code, issue the **&F1** command and then get back online and try your transfer again. If you still have trouble, one of the following could be causing the problem:
  - Line noise. Refer to the "Line Noise" section in Chapter 3.
  - Wrong modem cable, especially on a Macintosh. Refer to the "Flow Control & Hardware Handshaking Cables on External Modems" in Chapter 3.
- If your transfer rate when downloading seems slow, try the following:
  - If your software protocol (Ymodem, Kermit, etc.) shows many blocks being resent and the Receive Error (**RE**) message is never displayed (on modems that support this message), you are probably losing data between the modem and computer — not the phone lines. Since the files you are transferring are probably pre-compressed, it will be best to set your computer rate close to the connection rate. For example, we recommend 19,200 bps for most 9600 and 14,400 bps connections. The section "Slow Downloads" in Chapter 3 provides more information.
  - If you are losing data when using Zmodem for file transfers, it is probably because data comes to the computer too fast for the computer's serial port to keep up with. To solve this problem, use your software to reduce your computer rate (as described in the previous paragraph), use a different transfer protocol, or use software flow control. The section "Flow Control & Hardware Handshaking Cables on External Modems" in Chapter 3 and the following steps explain how to use flow control:

1. Use your software to turn OFF hardware (RTS/CTS) flow control. This should automatically turn ON software (XON/XOFF) flow control, but you may need to use your software to manually turn on software (XON/XOFF) flow control.
2. Issue the **&K4** command to turn ON software flow control in the modem.
3. Issue the **&W** command to save the setting.

- If your software locks up during a file transfer or large data transfer, and you are using hardware flow control (**&K3**), one of the following may be the problem (also see the section "Flow Control & Hardware Handshaking Cables on External Modems" in Chapter 3):
  - Flow control is turned off in your software. Use your software to turn flow control (or hardware handshaking) on.
  - Your modem cable does not support flow control. Use the cable that may have been provided with your modem and/or refer to Chapter 3.
  - Data is coming into the computer faster than it can accept it. For more information, refer to Chapter 4 and the "Serial Port Speed" section in Chapter 3.
- If your software locks up during a file transfer or large data transfer, and you are using XON/XOFF software flow control (**&K4**), you may be trying to transfer binary data. Some data may include the special XON and XOFF characters — thereby confusing the modem. Disable XON/XOFF flow control. The descriptions of the **&K** command in Appendix B provide information on your options.
- If you are losing characters or data due to the buffer overflowing, the section "Faster UART Chip for PC Compatibles used with External Modems" in Chapter 3 explains some causes and solutions.
- If you enter the escape code (**+++**) but the modem does not acknowledge it by sending the **OK** result code, one of the following may be the problem.
  - You issued the plus signs (+) too quickly. Wait two seconds after sending any characters before sending the escape code, then send the escape code, and then wait two more seconds.
  - Your computer rate is different than the connection rate with a Direct connection. Use your software to change your computer

rate. To do this, you need to disconnect, set the new rate, and then reconnect.

- The escape code character has been changed in register **S2** from a plus sign (+) to something else. Change the escape code character back to a '+' or use the character in **S2**.

- If you cannot get your software to hang up, issue the escape code (**+++**) followed by the **H** command. (If this doesn't work, you can turn the modem off to make it hang up, but this isn't a good long-term solution.) After your software hangs up, so that it won't happen in the future, check your software to see if it uses DTR or **+++** to hang up. (If you use a Macintosh, your software probably uses **+++**.) Then do one of the following:
  - If your software uses DTR to hang up, issue **&D2** followed by **&W**.
  - If your software uses **+++** to hang up, increase the length of time between the **+++** and the **ATH** in your software. Most software uses tildes (**~**) to lengthen time; if yours does, add two or three more tildes to increase the timing.
  - If these suggestions don't solve the problem, read your software manual to learn what your software needs to hang up properly.
- If you have changed your modem configuration and can't get your modem to work properly, try resetting it to the factory settings **&FØ**, **&F1** or **&F2** and reread Chapter 8.

Problems with High-Speed Connections

Many of the trouble-shooting issues covered in the above sections apply to high-speed communication. However, there are a few additional factors that you should consider when you are communicating at speeds of 14,400 bps and above. For additional information on high-speed communication, refer to Chapter 3.

- If you can connect, but the speeds at which you connect are lower than what you expect, you need to identify the cause of the slow speed. Consider the following:
  - To achieve high-speed communication both your modem and the modem with which you are communicating (also known as the remote modem) must be capable of high speed. If you consistently

have problems with a specific modem, check with someone at the remote site to make sure of that modem's capabilities.

- Line noise may be causing the problem. You may have experienced line noise with voice calls and noted that sometimes simply hanging up and re-dialing can cure the problem. You may wish to simply try the call again if you are having problems maintaining high speed. Refer to Chapter 3 for a more detailed discussion of line noise issues.
- If you are having trouble making a high-speed connection, you may wish to force your modem to a slower speed to see if it connects. Type **AT NS37=6 [CR]**. This forces the modem to try to make a 2400 bps connection. Refer to Chapter 3 for more tips on changing your modem speed.

- If you find that you lose data during a high-speed file transfer, the problem is probably that your computer cannot keep up with the speed of the data transfer.
  - You must have the right kind of cable connecting your modem to the computer. To achieve high-speed communication with data compression and error correction, you need a "RTS/CTS Hardware Handshaking Cable." Refer to Chapter 3 for details.
  - If you are using a PC, the problem may be with the UART. A 16550 UART works better than a 16450 UART for transmitting high-speed communications. Refer to Chapter 3 for more details.
  - If you are using a Mac, serial port speed on most Macs is limited to 57,600 bps. If you have a Mac into which you can install a NuBus card, you may be able to boost the data throughput speeds by adding a high-speed serial board or other high-speed adapter to your computer.
  - Another general rule is the faster processor that your machine has, the better it will be for high-speed transfers. A Power PC, 68030/68040, Pentium, or 386/486 machine is less likely to have problems with losing data during transfers than a 68000 or 80286.

Problems with Silent Answer

Chapter 6 explains how to set up and use Silent Answer. If you have problems with Silent Answer, this section should help you solve them.

Before you begin troubleshooting, it's helpful to know what to expect from your modem when Silent Answer is enabled. In addition to the modem activities described below, your software display can give some helpful feedback when your modem is using Silent Answer.

Silent Answer uses the incoming ring signal to start the process of "listening in" on the incoming call. After a ring, the modem partially picks up the telephone line and listens for a fax CNG tone. (On some modem models, the **OH** light comes on as the modem picks up.) After 2–3 seconds the modem hangs up so it does not interfere with the next ring signal.

After the call is answered by a telephone device (your answering machine or you with your telephone), Silent Answer listens for an incoming fax CNG tone. It may not hear the CNG tone during its first 2-3 second "snoop" because the CNG tone cycle is 4-5 seconds. If the modem does not receive another ring signal or hear a CNG tone 6 seconds after a ring, it starts a second snoop session, this time for 15 seconds. The modem should hear the fax CNG tone during one of the 2 snoop sessions. Your modem and the device calling in (fax machine, or faxmodem) may then start a series of tones in an attempt to connect. They usually achieve a connection.

With Optional Feature #141, the modem snoops continuously between rings and for 15 seconds after the last ring (if a CNG tone is not detected).

Before you do anything else, read the Silent Answer section in Chapter 6 to ensure that your modem, software, and answering machine are set up to use Silent Answer.

Receiving Faxes

It may be helpful to have some faxes sent to you while you explore these possible solutions. To receive a fax from the FaxBack System, call the number at the back of this manual and order a document using a touch-tone phone. The FaxBack System faxes the document to your faxmodem right after you order. Instructions for ordering documents are given when you call.

- If you are unable to receive a fax at all while using Silent Answer, one or more of the following may be the problem.
  - Your modem does not support Silent Answer, or your modem has an older version of Silent Answer. Check to see if your modem supports Silent Answer by typing **AT I10 [CR]** to

review the optional features codes. If code number 141 is displayed, you DO have Silent Answer. Check the ROM version by typing **AT I3 [CR].** See the section "What ROM Version Do You Have?" later in this chapter for more information.

- Silent Answer is not enabled properly. Review the section of Chapter 6 that provides information on enabling Silent Answer.
- The fax software is not turned on or hasn't been properly initialized. You may need to restart your computer or fax software to activate any changes made while enabling Silent Answer or changing fax drivers.
- The fax software is installed for the wrong fax driver. Check your *Getting Started* manual for information on setting up your software to find out how to install your software for a fax driver that your modem supports and that works with Silent Answer.
- DTR ("Data Terminal Ready") is not present. Normally, your computer sends the DTR signal to the modem to indicate that it is ready to accept data from the modem. The computer lowers the DTR signal to make the modem hang up. The presence of DTR is indicated on external modems by the **TR** or **DTR** light. There is no clear way to detect the signal on an internal modem.

  If you use a Macintosh, DTR might not be present because some Mac fax software (such as FAXstf™) uses the **ATH** command, and not the DTR signal, to tell the modem to hang up. If you are using a Macintosh with FAXstf (and possibly other Mac fax software) you may need to tell the modem to ignore the DTR signal, and to wait for the **ATH** command instead. To do this, change **&D2** in the initialization string to **&DØ** and restart your modem fax software. If your initialization string does not include **&D**, check your software user manual for information on adding the **&D** command to your initialization string. The **&F1** command includes **&DØ.**
- The fax software or modem may have a problem that is unrelated to Silent Answer. Try receiving a fax while Silent Answer is disabled and your answering machine and other telephone devices are disconnected. If you are unable to receive

a fax at all, review your fax software manual for trouble-shooting tips

- If you can receive faxes when a telephone receives the call but not when your answering machine receives the call, one of the following may be the problem.
  - Line noise (due to several telephones or other devices being connected to the phone line) is interfering with Silent Answer. Cordless telephones can also interrupt phone lines.
  - There is a timing problem between the answering machine and the fax software, causing the answering machine to hang up before the fax software starts the faxing procedure. The fax software may not immediately detect that the line has been hung up and may try to receive a fax. Try changing fax software or answering machines. WinFax™ Lite software users can sometimes solve this problem by upgrading to the full version of WinFax.
- If the answering machine keeps playing its message when the faxmodem answers the fax, one of the following may be the problem.
  - The answering machine is not designed to hang up when another device picks up the line.
  - The answering machine normally hangs up when another device picks up the line, but line noise due to several devices on the same line, such as other telephones or a cordless telephone, is interrupting the answering machine's normal operation.

Receiving Voice Calls

If voice calls are not being sent to the answering machine and are being received by the faxmodem, one of the following may be the problem.

- The fax software is answering the call instead of the answering machine. One of the following may be happening.
  - Your modem is set to answer on fewer rings than the answering machine, causing the modem to answer the call. Set your modem to answer on two rings more than the answering machine.

- If you are using FAXstf fax software and Caller ID, Caller ID may be interfering. You can turn off Caller ID by typing **AT #CID=Ø [CR]** or by adding **#CID=Ø** to the initialization string.
- A sound in your answering machine's outgoing message is being interpreted by the modem as a fax CNG tone. Music or other sounds at the first few seconds of your outgoing message can cause this problem. Be sure to leave silence at the first 2-3 seconds of your outgoing message.

• Line noise (due to several telephones or other devices being connected to the phone line) is interfering with Silent Answer. Cordless telephones can also interrupt phone lines.

Testing Procedures

If you were unable to solve your problems by using the above methods, you may need help. Before calling for assistance, try to isolate the problem by working through the following testing procedure. This procedure does not offer solutions to the problems you are experiencing, but helps identify the origin of the problem. Take notes of your testing results and have them with you when you call technical support, so technical support can address the problem quickly.

To properly isolate the problem, the following steps should be performed in order and one at a time. For steps that require you to receive a fax, have the same fax machine or fax modem (called a fax generator in these steps) call you each time. You might find it helpful to use the FaxBack Service as the fax generator.

1. Receive faxes with Silent Answer disabled and all other devices disconnected.
   a. Unplug all telephone devices that are connected to the modem or are connected to extensions. This includes any telephones, answering machines, other modems, etc.
   b. Make sure Silent Answer is NOT enabled. You may need to reinstall your fax software or re-enter the original initialization strings, and then restart the fax software.
   c. Set the fax software to receive a fax on the second or third ring.
   d. Have your fax generator send a fax to your faxmodem.

e. If you can receive a fax correctly, proceed to step 2.

2. Receive faxes with Silent Answer enabled and all other devices disconnected.
   a. Enable Silent Answer, using the instructions in Chapter 6.
   b. Turn on the fax software's auto receive.
   c. Restart the fax software so that the modem is properly initialized for Silent Answer.
   d. Have the fax generator send your modem a fax. Your external modem's display or internal modem's software display should indicate that the modem is attempting to receive the fax.
   e. If you can receive a fax correctly, proceed to step 3.

3. Receive a fax with a telephone as the answering device. This lets you to monitor the incoming sounds. Do not use a cordless telephone. They can create problems for some people. Connect your telephone as you would connect your answering machine (do not plug the phone into the modem; use a Y-splitter or another phone jack on the same line—i.e. in another room). Do not connect the answering machine.
   a. Turn on your fax software's auto answer and set it to answer on the third ring.
   b. Connect the telephone and modem to the phone line.
   c. Have your fax generator call your telephone.
   d. Answer the telephone on the second ring while watching the modem. With some internal modem models, you can watch your software's on-screen display. On some external modem models, the **OH** light will come on. If you hear the calling CNG tone (a beep, 5 seconds of silence, beep) while the **OH** light is on, the fax software should wake up and indicate that it is starting to receive a fax.

      Keep listening until you hear a loud, high-pitched tone from the faxmodem. When you hear the high-pitched tone, you can hang up the telephone and receive the fax.

      If the faxmodem did not respond to the CNG tone by sending the high-pitched tone, continue to listen. What happens next depends on your modem model:

- Some modem models wait for 5-6 seconds, and then again monitor for the fax CNG tone. This time, these models monitor the line for 6 seconds instead of 2-3 seconds.
- Other modem models continuously monitor for the fax CNG tone.

The faxmodem should hear the calling CNG tone during this second monitoring phase.

e. If you can receive a fax correctly, proceed to step 4.

4. Have a friend call to make sure that the faxmodem properly handles a voice call. Answer the call on the second ring. The modem should not interrupt the call. If the voice call is handled properly, proceed to step 5.

5. Remove the telephone you had connected in steps 3 and 4 and connect your answering machine instead. Then receive a fax while Silent Answer is enabled and your answering machine is added. If you can receive a fax correctly, proceed to step 6.

6. Start adding your other telephone devices, if you have any, one at a time, testing each time (by receiving a fax with Silent Answer enabled) to make sure that Silent Answer is working correctly.

Miscellaneous Problems

What ROM Version Do You Have?

Your modem's "ROM" is a set of computer chips that contain the low-level computer instructions that make the modem function. These ROM chips include standard modem capabilities provided by the ROM manufacturer. The ROM chips for some models of modems also include various enhancements that have been added to the modem, enhancements that are not available on other manufacturer's modems using the same basic ROM chips.

If you need to know what ROM version you have, open your telecommunications software to terminal mode, and type the following commands. **[CR]** represents a carriage return.

ATI3 [CR]

This command is the letter "I" followed by the number "3." It is NOT the number "13."

The modem responds by displaying the ROM version number and related information. For example, if you have a SupraFAXModem 288, when you issue the **I3** command for your 28,800 bps modem, you may see something like this :

V1.000-08-V34_DS

When you issue the **I3** command for a 14,400 bps modem, you may see something like this:

V1.510-04-DS29

For more information on issuing commands, refer to Chapter 2.

Updating to Newer ROM Version

Some modems include Flash ROM. These modems have optional features #190 or #191. You can determine which optional features your modem has by typing **AT I10 [CR].**

If your modem does include Flash ROM, you can upgrade the modem's ROM version by downloading new firmware. Call Technical Support or our BBS for specific information on the latest version of the firmware and details on how to perform the download.

If your modem does NOT support optional feature #190 or 191, you may still be able to upgrade your ROM version by replacing the ROM chips on your modem. If you think you may need a ROM upgrade and if you do not have optional feature #190 or #191, contact Technical Support for information on chip replacement.

Power Supplies

It is very important that you have the proper power supply for your local AC power. The modem requires a very exact voltage and current. Using AC converters or adapters that don't meet your modem's specification can result in the modem not functioning, overheating, or ultimately failing. Simply using a converter with the U.S. 110V supply will not work adequately in most cases. The adapter that came with your modem is approved. Others may be included by your local dealer or importer and may, or may not, function correctly.

Compatibility With Other Modems/Older Modems

Your modem has been tested with most major brands of modems, and all of these modems work properly with the protocols your modem supports. If you cannot make a connection and you suspect the remote modem might be the source of the problem, consider the following:

- The remote modem might use a proprietary protocol that we do not support. Some modems with proprietary protocols are US Robotics HST, CompuCom, Telebit, and Hayes V Series. You should be able to communicate with most of these at least at 2400 bps. Some of these modems feature "dual-standard" operation, meaning they support their proprietary standard as well as V.32 or V.32bis. However, if the remote modem's dual-standard feature has not been configured properly, you may not be able to connect at V.32 or V.32bis.
- The remote modem might need a firmware upgrade if it was purchased some time ago. Several pioneers in the high-speed modem business have released upgrades to fix compatibility problems with early units.
- If the remote modem is a 2400 bps modem that does not support error correction/data compression, it may not allow enough time for the "negotiation" process. Try turning off correction/compression by issuing the **\NØ** command. For more information about **\NØ** and negotiation, refer to Chapter 4.

10

If You Need Help

If you need help with your modem, please first try the suggestions provided in Chapter 9. If you still need assistance, please contact Supra technical support as described in this chapter.

When You Contact Supra

Make sure you have all of the following information handy before contacting Supra:

- the results of typing the **I3** command (if possible), as explained in Chapter 9
- your computer model (i.e. PC compatible 486)
- your modem model (i.e. SupraFAXModem 144i)
- the names and version numbers of any software you're using with your modem (i.e. FAXcilitate 1.7 fax software)

Ways to Contact Supra

Supra offers a wide range of methods for obtaining technical support. Our technical support department can be reached by telephone, fax, or through many online services including Supra's own BBS.

Fax and online services offer several advantages over calling when contacting technical support. For instance, technical Support can be reached by fax or through online services 24-hours-a-day, seven-days-a-week. Also, the answers to many of the most often asked questions can be found on our FaxBack System or in places such as Supra's forum on CompuServe (GO SUPRA). If you choose to call Supra, it is very helpful if you have your computer on and are seated at it when you call.

If you are in Europe, you may contact our offices in Germany for customer service and technical support. The phone numbers are listed below.

Technical Support Information

The Technical Support Information line plays a recording citing the various technical support services and how to reach them.

The Technical Support Information line is available 24-hours-a-day, seven-days-a-week

In the U.S. and Canada only call: **(800)774-4965**
From all other areas call: **(360)905-1499**

Technical Support — Online

Questions can be posted and files uploaded/downloaded. Answers are posted by the end of the next business day. So, if you post a question on Tuesday, you can expect to see the answer by the end of Wednesday. If you post a question on Saturday, you can expect to see the answer by the end of Monday.

Unless otherwise noted, all online services listed are available 24-hours-a-day, seven-days-a-week

Supra BBS

This service offers help files for setting up a variety of software applications, troubleshooting guides, drivers, flasher utilities, shareware utilities relevant to our products, and sysop order forms. See instructions for calling our BBS, later in this chapter.

The telephone number for the Supra BBS is
(503)967-2444
In Europe, call: **+49 (0) 2235 9220 43**
(SupraFAXmodem 288) or **+49 (0) 2235 9220 44**
(ISDN modem)

CompuServe

Supra has its own forum on CompuServe. This forum provides you with answers to technical questions and inquiries about your Supra product. You can find specific message sections to help you direct your question to the appropriate area. You can also find a number of libraries that contain valuable information about configurations, updates, product announcements, troubleshooting guides, utilities, helpful documents, and sysop order forms. A conference room is also available.

Our address on CompuServe is **GO SUPRA**.

America On Line

This service gives you email access to technical support.

Our address on America On Line is **supracorp2**.

AppleLink

This is a Macintosh-only service providing email access to technical support and offering help files for setting up a variety of software applications, troubleshooting guides, drivers, flasher utilities, shareware utilities relevant to our products and sysop order forms. No public discussion areas are monitored or available.

Our address on AppleLink is **D2456**.
In Europe, the address is **Supra.Ger.**

eWorld

This is a Macintosh-only service that offers help files for setting up a variety of software applications, troubleshooting guides, drivers, flasher utilities, shareware utilities relevant to our products and sysop order forms. It also allows you to participate in a public forum.

The shortcut for eWorld is **supra**.

Apple Remote Access (ARA)

This is a Macintosh-only service that offers help files for setting up a variety of software applications, troubleshooting guides, drivers, flasher utilities, shareware utilities relevant to our products and sysop order forms. No messaging capabilities are available.

The telephone number for our ARA server is **(360)905-1544.** Logon as **Guest**.

FidoNet

This service offers the suprafax echo which is a public message forum similar to an Internet Newsgroup. Supra monitors this echo regularly. FidoNet offers help files for setting up a variety of software applications, troubleshooting guides, drivers, flasher utilities, shareware utilities relevant to our products and sysop order forms.

Our address on FidoNet is **SupraCorp** (no period) or if you have access to NetMail send messages to Supra Corp at **1:357/4.** For file access, FREQ **1:357/4.** Magic Names **FILES** for a current file list and **HELP** for assorted help files. Our address on International Echo is **SupraFAX**.

GEnie

This service that offers help files for setting up a variety of software applications, troubleshooting guides, drivers, flasher utilities, shareware utilities relevant to our products and sysop order forms. It also allows you to participate in a public forum.

Our address on GEnie is **SupraTech**.

Internet

This service that offers help files for setting up a variety of software applications, troubleshooting guides, drivers, flasher utilities, shareware utilities relevant to our products and sysop order forms. It also allows you to participate in a public forum.

Our addresses on Internet are:

PC and general support	**supratech@supra.com**
Macintosh support	**mactech@supra.com**
Amiga support	**amigatech@supra.com**
FTP site	**ftp.supra.com**

Technical Support — FaxBack System

You can choose to have faxed to you a catalog of often-asked technical questions as well as other information on Supra products. After choosing topics that interest you, you can then use this automated system to have short explanations of these topics faxed to you. Complete instructions are provided when you call this number.

The FaxBack System is available 24-hours-a-day, seven-days-a-week.

The telephone number for the Faxback System is **(503)967-0072.** A touch tone telephone is required to use this service.

Technical Support — Telephone

We encourage you to use the online services or fax to contact Technical Support. Those services provide ready access to our technicians without running up your long distance bill. If you can't reach us by fax or through any of the online services, please call.

The telephone lines for Technical Support are open Monday through Friday, 7 a.m.–5 p.m. PST unless noted otherwise.

The telephone numbers for Technical Support are:

PC	**(503)967-2490**
Windows	**(503)967-2491**
Macintosh	**(503)967-2492**
Amiga and Other Systems	**(503)967-2493** (9:00AM to 12:00PM only)
In Europe:	**+49 (0) 2234 9859 28**

Other Ways to Contact Technical Support & Sales

You can send us a fax with your technical support questions or sales orders 24-hours-a-day, seven-days-a-week. Be sure to include your name and return fax number on all faxes.

The fax number for technical support is **(503)967-2401**. The fax number for sales is **(360)905-1401**. In Europe, the fax number is **+49 (0) 2234 85068**.

If you want to mail something to us, our mailing address is:

Supra Corporation
7101 Supra Dr. SW
Albany, OR 97321 USA

Our mailing address in Europe is:

Supra GmbH
Carl-Friedrich-Gauß Straße 7
D-50259 Pulheim,Germany

If you want to place an order, our toll free telephone number for sales is **1-(800)-727-8772**, or, you can call **(360)905-1410**. Our sales telephone number in Europe is **+49 (0) 2234 9859 0**.

You can place orders or find out information about your order through Internet. Our Internet address for general sales is **sales@supra.com**. Our Internet address for order status is **orders@supra.com**.

Returning Product

Do not return any equipment to Supra for service without first contacting us and obtaining a Return Authorization (RA) number. We need this for proper tracking of your repair.

Supra Bulletin Board System (BBS)

For the most up-to-date information on Supra's products and quickest help, we recommend calling our BBS. It contains the latest version of this manual along with other useful files. You may also find that other users have already asked your specific question and the answer has already been posted. The service only costs a phone call and is available 24-hours-a-day. Most questions are answered within one working day of posting.

Connecting to the Supra BBS

To connect to the Supra BBS:

1. Follow the general instructions for going online in your *SupraFAXModem Getting Started Manual.* The Supra BBS phone number is listed earlier in this manual in the section entitled *Technical Support — Online*.

2. In your telecommunications software, set your modem to 38,400 bps or the speed best supported by your computer and Hardware Flow Control. If necessary, also select 8 data bits, 1 stop bit, and N or none (for no parity).

3. In your telecommunications software terminal mode, issue **AT&F1** (if you have a Macintosh) or **AT&F2** if you have any other type of computer). Then use your software to dial the BBS number, which is on the back page of this manual.

4. Once you have connected, follow the BBS instructions for logging on.

Supra BBS File Area

The Supra BBS File Area contains hundreds of files: telecommunications software (also called terminal programs), upgraded SupraFAXModem drivers for popular telecom software, third-party bulletins, information from Supra, and various other files. Many of these files are only available on the Supra BBS.

These files are free. Your only cost when downloading them is the phone call cost. At the speeds possible with your SupraFAXModem, this cost — even if the call is long distance — can be very little.

In addition to the data and text files, there are many "shareware" programs available on the Supra BBS. Shareware means you can download, try out, and distribute the program for free, and pay only if you decide to keep it. Supra encourages you to be honest about shareware fees and royalties, and to pay the appropriate fees if you decide to keep any shareware you download from the Supra BBS.

How to Find Files in the File Area

To see a directory of files available on the Supra BBS:

1. Connect to the Supra BBS as described previously.

2. From the **Main Menu**, select **F** for access the File Area.

3. Select **C** for a complete list of files. This list is updated frequently.

4. Now you can either display the file list on your screen or download it to a file on your computer, as follows.

   To display the file list on your screen: Select **T**.

   To download the file list to a file on your computer:

a. Select a transfer protocol supported by your telecom software. If you are unsure which transfer protocols your software supports, you can try selecting Z for Zmodem.

b. Use your telecom software to download the list.

Commonly Used Files

The following are some of the most popular and most useful files available in the Supra BBS Online Manuals Area:

Filename	Description
REF_MAN.TXT	Latest version of this manual
CFIG_ALL.TXT	Information on overcoming problems with specific software
V34_LIST.TXT	An expanded listing of commands for the V.34 protocol.
144_LIST.TXT	Less-common AT commands and S registers for your 14,400 bps modem that are not in the *SupraFAXModem Reference Manual*
CLASS_1.TXT	Class 1 fax commands
CLASS_2.TXT	Class 2 fax commands
SIL_ANSR.TXT	Silent Answer
IRQCONF.TXT	Troubleshooting IRQ conflicts
CABLES.TXT	Wiring diagrams for Macintosh and PC hardware handshaking cables
POWER.TXT	Power supplies approved for use outside North America

A

Optional Features

This appendix describes optional features supported by various modem models. To learn which optional features your modem supports, open your telecom software to terminal mode, and then type the following command line:

ATI10 [CR]

This lists the numbers of the optional features your modem supports.

In this appendix, optional features are listed by number followed by a brief description. In many cases there is also an indication of where to look in the manual for more detailed information.

101 Fax Class 1

Support for Class 1 fax standard (software control of page framing protocols). See Chapter 1 for more information on fax standards.

104 Fax Class 2

Support for Class 2 fax standard (modem control of page framing protocols). This is a standard that was adopted by the industry prior to the official acceptance of the Class 2 standard. This standard is also commonly known by it's "proposal number" TR29.2. See Chapter 1 for more information on fax standards.

105 Fax Class 2.0

Support for Class 2.0 fax standard. This is the standard for modem-control of page framing as officially accepted by the ITU-TSS. See Chapter 1 for more information on fax standards.

115 ITU-TSS V.17, 14,400 bps Fax

Modems that include option 115 use the ITU-TSS V.17 standard for 14,400 bps fax speeds. Faxes can be both sent and received at 14,400 bps.

120 Worldwide Support

This option is available for modems that are designed for international use. It enables the following commands and S registers: *NC?, *NC*n*, and S80. Appendix B describes the commands. Appendix D describes the S register.

Additional Worldwide Support features are listed in the next few sections. Their feature numbers begin with "12."

121 ITU-TSS V.23

The ITU-TSS V.23 protocol is used for 75 bps/1200 bps communication where available. This feature enables the %F command (which is described in Appendix B) and the following result codes: 22, 23, 44, and 45. Appendix C explains these result codes.

122 ITU-TSS V.25bis

The ITU-TSS V.25bis protocol is an alternative option to the Hayes "AT" command set. It is used primarily in Europe. If you plan to use the V.25bis commands, refer to your software manual or other source for a description of their functions.

The V.25bis command set is enabled using the **S80** command, which is described in Appendix D.

123 Blacklisting

Enables the *B and *D commands, which are used in countries that require the blacklisting standard. Also enables result codes #24 and 32. Appendix B describes the commands. Appendix C describes the result codes.

124 Access Security

Access Security allows you to control who has access to your modem. The following steps describe how it works.

1. Enable access security by setting the **S80** register on your modem. Once enabled, secure access stays enabled until you disable it by issuing the **S80** command or the connection ends.

2. Set a password by issuing the ***C** or ***Pn** command. Your modem provides two levels of access security that prevent unauthorized users from connecting with your modem. The first level (***C**) prompts for a password verification before connecting with the remote modem. The second level (***Pn)**, called Callback Security, includes the first level, but does not establish a connection until it has disconnected and called back the remote modem.

3. The remote modem user calls your modem, and your modem answers.

4. The remote modem user sees the **REMOTE PASSWORD** prompt and then enters a password.

   *If you have previously set a password using ***C***: If the remote modem user enters the correct password, the user now has access to your modem.

   *If you have previously set a password using ***Pn***: The remote modem user now hangs up. If the password the remote modem user entered was correct, your modem calls the remote modem and establishes a connection. The remote modem user now has access to your modem.

   An error-correcting (MNP or V.42) connection is required.

5. The remote modem user enters the ***R** command to request access to your modem. If the request is granted, the remote modem user sees the **!AT** prompt.

6. The remote modem user issues commands from a subset of the AT command set. These commands must be issued without the "AT" prefix that usually precedes AT command lines.

7. The remote modem user issues the ***E** command to end the remote configuration mode access, and then disconnects.

The commands used in this procedure are described in Appendix B. The S register is described in Appendix D.

140 ITU-TSS V.32bis, 14,400 bps Data

Supports the ITU-TSS V.32bis standard for 14,400 bps data speeds.

141 Silent Answer

Supports the Silent Answer feature which directs the handling of incoming fax and voice calls. See Chapter 6 for more information.

142 Caller ID

Supports the Caller ID function. You must also have Caller ID support from your telecommunications provider and your software. See Chapter 6 for more information.

143 MNP 10

Supports the MNP command set, which includes *H, -B, -C, -K, -Q, and -U. Appendix B describes these commands.

144 MNP Cellular

Supports the standards for data transfer from a cellular telephone connection. The)M command supports this feature; it is described in Appendix B.

145 AutoSync

A standard protocol for emulating synchronous communications.

146 Enhanced Configuration Display

Utilizes the **\S** command for enhanced configuration display. See Chapter 8 and Appendix B for more information.

147 V.FC 28K

Enables data speed communication of up to 28,800 bps using the V.Fast Class protocols.

148 Volume Cntrl L+/L-

Allows setting of volume range on modems that use the computer's speaker for sending sounds used in monitoring modem connections. Appendix B explains this command.

149 V.FC 24K

Enables data speed communication of up to 24,000 bps using the V.Fast Class protocols.

150 Enhanced &F Option

If your modem supports option 150, it is optimized for the Macintosh. Optimization settings are as follows

\N3	AutoReliable connection. Makes the fastest possible connection and uses the best possible error correction and data compression.
&K3	RTS/CTS hardware flow control. Allows you to use data compression and error correction.
&Q5	Asynchronous error correction mode.
&DØ	Selects correct DTR settings so hardware handshaking flow control works.

151 Enhanced Rate Renegotiation

If your modem supports option 151, you will be able to utilize the **%E, %G, S109**, and **S110** commands and S registers for enhanced rate negotiation. Chapter 3 explains this feature.

153 ITU-TSS V.34 28,800 bps Data

This feature enables a speed range from 28,800 bps to 2400 bps and allows those speeds to adjust without disconnecting.

154 Silent Answer Plus

Supports the Silent Answer Plus feature which improves the handling of incoming fax and voice calls. See Chapter 6 for more information.

157 RINGING Response

This optional feature displays on your monitor the word "RINGING" for outgoing calls before a connection has been established.

You can turn this feature on by setting the high bit in S95 to 128.

See Appendix D for a discussion of the S95 register

160-162 Supra Voice Processing™ (SVP).

Optional features 160, 161, and 162 all relate to various capabilities of modems that support voice processing. If your modem supports voice processing capabilities, these capabilities are explained in separate documentation included with your modem.

170 Handset Support.

Allows you to connect your telephone handset directly to the modem. This enables you to by-pass a traditional telephone and utilize your modem for all telecommunications functions.

171 Headset Support.

Allows you to connect a special headset directly to the modem. This enables you to by-pass a traditional telephone and utilize your modem for all telecommunications functions.

180 16550 UART Emulation

Available on internal boards for PC-compatible computers, 16550 UART emulation reduces the risk of lost data as high-speed modems transfer data to the computer. Refer to Chapter 3 for more information on UART functions.

181 SupraSmart UART

Available on internal boards for PC-compatible computers, the SupraSmart UART option utilizes a special Supra buffering technique to further reduce the risk of lost data as high-speed modems transfer data to the computer. Refer to Chapter 3 for more information on UART functions.

182 Rockwell High Speed Interface

This is available on some internal boards for PC- compatible computers. The RHSI UART option utilizes a special bus interface to allow ultra high-speed data transfer through a special Windows interface.

190 AMD Flash ROM

Modems with optional feature 190 utilize Flash ROM manufactured by AMD. Refer to Chapter 9 for information on using the Flash ROM to update the firmware in your modem.

191 ATMEL Flash ROM

Modems with optional feature 191 utilize Flash ROM manufactured by ATMEL. Refer to Chapter 9 for information on using the Flash ROM to update the firmware in your modem.

B

AT Command Descriptions

This appendix describes data mode commands your modem supports.

+++ Escape Code
See Chapter 2

A Answer Phone Line
See Chapter 6

A/ Re-execute Last Command

Re-execute the last command issued, whether by you or your software.

AT "ATtention" Command Line Prefix
See Chapter 2

B BELL/ITU-TSS Protocol Compatibility
See Chapter 9

D*n* Dial Telephone Number
See Chapter 5

E Command Echo

Controls the echo of characters sent to your modem from your computer when the modem is in the command state.

E Inhibit command echo. If you see two characters for every one you type (i.e. **AT** looks like **AATT**), issue **E**.

E1 Enable command echo (default). If your computer does not display the characters you type, issue **E1**.

F Line Modulation

This command is only used by V.FC. Clears register **S31** bit 1. **FØ** through **F10** set the only acceptable line modulation for a subsequent connection. **F13** through **F19** recommend a connection rate.

F Use auto-detect mode to make best possible connection (default). Same as **AT N1**.

F1 Select V.21 or Bell 103 300 bps.

F3 Select V.23.

F4 Select V.22 or Bell 212A 1200 bps.

F5 Select V.22bis 2400 bps.

F6 Select V.32bis or V.32 4800 bps.

F7 Select V.32bis 7200 bps.

F8 Select V.32bis or V.32 9600 bps.

F9 Select V.32bis 12,000 bps.

F10 Select V.32bis 14,400 bps.

F13 Select V.FC 14,400 bps. Same as **AT NØ S37=15**.

F14 Select V.FC 16,800 bps. Same as **AT NØ S37=16**.

F15 Select V.FC 19,200 bps. Same as **AT NØ S37=17**.

F16 Select V.FC 21,600 bps. Same as **AT NØ S37=18**.

F17 Select V.FC 24,000 bps. Same as **AT NØ S37=19**.

F18 Select V.FC 26,400 bps. Same as **AT NØ S37=20**.

F19 Select V.FC 28,800 bps. Same as **AT NØ S37=21**.

H Hook Control

H On-hook (hang up).

H1 Off-hook (pick up phone line).

I Report Identification & Diagnostic Information

I Report product code I.D.

I1 Perform a checksum computed on the firmware ROM, and returns three ASCII numeric characters followed by a carriage return and line feed character.

I2 Perform a checksum on the firmware ROM, and returns **OK** or **ERROR**.

I3 Report ROM code revision number.

I4 Report supported protocols, in encrypted format.

I5 Report firmware copyright information.

I6 Report country code information.

I7 Report data pump version information.

I10 Report optional features supported by your modem. Appendix A provides more information.

L Speaker Volume

L=low, **L2**=medium (default), **L3**=high.

L+ Relative Speaker Volume — Optional Feature #148

Allows setting of volume range on modems that use the computer's speaker for sending sounds used in monitoring modem connections. To use this setting, first issue **L2** to indicate that you are setting the speaker's volume to "medium". Then indicate what the medium volume will be.

L+*n* **L+** followed by a number from 1-32 increases the speaker volume.

L-*n* **L-** followed by a number from 1-32 decreases the speaker volume.

Note that by using **L+*n*** and **L-*n***, you raise or lower the entire volume range by a unit of *n*. The number *n* that you choose is not a specific volume level; it is the number of units by which you raise or lower the range of volumes possible.

M Speaker Control

M Always off.

M1 On until carrier is received (default).

M2 Always on.

M3 Off while dialing and after carrier is received; on when answering.

N Connection Rate

See Chapter 7

N Connect only at rate specified in **S37**, or, if **S37=Ø**, connect at the rate at which the last **AT** command was issued. Only attempts connection protocols specified by the **B** command.

N1 Connect at the highest rate supported by both modems. The **B** command setting is ignored, and the modem attempts best possible connection (default).

O Going Online

O Go online.

O1 Go online; initiate retrain sequence if connected at or above 2400 bps.

P Pulse Dial

Use pulse dialing for all subsequent dial commands.

Q Enable/Disable Result Codes

See Appendix A

Q Result codes enabled (default).

Q1 Result codes disabled.

Sr? Read S Registers

See Chapter 8

Return the value in **S** register ***r***.

Sr=n Write to S Registers
See Chapter 8

Write value ***n*** to **S** register ***r***.

T Tone Dialing

Use tone dialing for all subsequent dial commands.

V Verbose / Numeric Result Codes
See Appendix C

V Numeric result codes.

V1 Verbose result codes (default).

W Error Correction Result Codes
See Appendix C

W Result codes not reported and **CONNECT XXXX** reports computer (DTE) rate (default).

W1 Result codes reported.

W2 Result codes not reported and **CONNECT XXXX** reports connection (DCE) speed.

X Dialing Type and CONNECT Result Codes

X Blind dial (ignore dial tone and busy signal) and send **CONNECT** when connected.

X1 Blind dial; send **CONNECT XXXX** result codes when connected.

X2 Wait for dial tone before dialing; send **CONNECT XXXX** result codes; do not detect busy signal.

X3 Ignore dial tone; send **CONNECT XXXX** result codes; send **BUSY** if busy signal detected.

X4 Wait for dial tone before dialing; send **CONNECT XXXX** result codes when connected; send **NO DIALTONE** code if dialtone is not received in 5 seconds; send **BUSY** if busy signal detected (default).

Zn Reset and Load Stored Configuration

See Chapter 8

Reset modem and load configuration stored in ***n*** (***n*=Ø** (default) or 1).

&C Select Behavior of Data-Carrier-Detect (DCD)

Determines DCD behavior. Default depends on **&F** setting.

&C DCD signal always on.

&C1 DCD indicates when carrier from remote modem is present.

&D Select Modem Reaction to DTR

Sets how your modem reacts to an on-to-off transition of **DTR**. This command acts differently depending on the **&Q** command setting. Default depends on **&F** setting.

	&DØ	&D1	&D2	&D3
&QØ, &Q5	none	2	3	4
&Q1	1	2	3	4
&Q2	3	3	3	3
&Q3	3	3	3	3
&Q4	1	2	3	4

1. Disconnect and send **OK** result code.
2. Switch to asynchronous command state.
3. Disconnect and return to command state. Auto answer mode disabled while **DTR** is off.
4. Perform soft reset (similar to **ATZ** command).

ATTENTION — When the modem is online, it ignores a change of **DTR** that persists for less time than the value in **S25** (default = .05 seconds).

&F Load Factory Default Configuration

See Chapter 8

&K Serial Port Flow Control

See Chapter 4

The default depends on the **&Fn** command used.

&K Disable flow control.

&K3 Enable bi-directional hardware (RTS/CTS) flow control.

&K4 Enable software (XON/XOFF) flow control.

&K5 Enable transparent software flow control.

&K6 Enable bi-directional hardware (RTS/CTS) and software (XON/XOFF) flow control.

&M Asynchronous/Synchronous Mode

This command determines the DTR operating mode. The commands &MØ-3 serve the same function as the commands &QØ-3. Supra uses the &Q commands.

&P Select Make/Break Ratio for Pulse Dial

Sets pulse dialing make (off-hook) to break (on-hook) ratio and pulse rates. These commands are not valid in all countries.

&P Select 39%/61% make/break ratio and 10 PPS (USA/Canada — default setting.).

&P1 Select 33%/67% make/break ratio and 10 PPS (UK/Hong Kong).

&P2 Select 39%/61% make/break ratio and 20 PPS.

&P3 Select 33%/67% make/break ratio and 20 PPS (Japan).

&Q Asynchronous/Synchronous Mode

Same as **&M**. Default depends on **&F**.

&Q Asynchronous Direct mode.

&Q1 Synchronous mode 1. Synchronous mode 1 is used with terminals that support both synchronous and asynchronous. After the call is placed in asynchronous mode, the modem switches to synchronous. If **DTR** goes from on to off, the modem returns to asynchronous.

&Q2 Synchronous mode 2. In synchronous mode 2, a stored number is dialed on an off-to-on transition of **DTR**. This number must be stored in location Ø with an asynchronous terminal using ***&Zx=n***. The modem returns to asynchronous mode on an on-to-off transition of **DTR**.

&Q3 Synchronous mode 3. Synchronous mode 3 is for manual dialing. With **DTR** off, dial the number. Then turn **DTR** on and hang up the voice phone. The off-to-on transition of **DTR** must be recognized by the modem before the phone hangs up or the connection will be lost.

&Q4 Reserved.

&Q5 Asynchronous Reliable mode (default).

&Q6 Asynchronous Normal mode.

&V Show Configuration Profiles

Display active and stored configurations. Also see **\S**.

&W*n* Write Active Configuration to Memory

See Chapter 8

Write active configuration to nonvolatile memory location Ø or 1. Do not place the **&W** command in your software initialization string, an often-used script, or anything else that causes it to be executed frequently. The modem's nonvolatile RAM can be written to (by **&W**) approximately 100,000 times before it dies. The RAM should easily last for as long as you use your modem. But if your software issues the **&W** command repeatedly when it is not necessary (e.g., from the init string), your nonvolatile RAM may die prematurely. Instead, when you need to execute **&W**, do so from your software's terminal mode. For more information on **&W**, nonvolatile RAM, and terminal mode, refer to Chapters 2 and 8.

&Y*n* Load Configuration Profile at Power-Up

See Chapter 8

Load stored configuration Ø or 1 at power up.

&Z*x=n* Store Telephone Number

See Chapter 5

+MS Select Modulation

This command lets you select a specific modulation, enable or disable automode, and specify the lowest and highest connection rates for your modem. You can report selected options and supported options. See Chapter 3 High-Speed Communications. The command format for AT+MS is:

AT+MS = <mod>,<automode>,<minimum rate>,<maximum rate> (press RETURN)

*B Display Blacklisted Numbers — Optional Feature #123

Returns a list of the blacklisted phone numbers on your modem. If no numbers are blacklisted, only the **OK** result code will be returned. Permanently forbidden numbers as defined by country requirements will not appear on this list.

*C Set a Password — Optional Feature #124

The ***C** command sets the password for your modem. Then when a remote modem issues the ***R** command to request your modem's remote configuration mode, that remote modem must supply the password set by the ***C** command. The password must be alphanumeric and between 6 and 12 characters long. The default password is QWERTY.

*D Display Delayed Numbers — Optional Feature #123

Returns a list of your modem's delayed phone numbers as defined by the ***B** command. If no numbers are delayed, the **OK** result code is returned.

*E Exit Secure Access — Optional Feature #124

The ***E** command exits remote configuration mode.

*H Link Negotiation Rate — Optional Feature #143

***H** Negotiate link at the highest supported speed.

***H1** Negotiate link at 1200 bps (useful with poor telephone lines). If this command is used and the modems make a LAPM connection, the connection rate will be fixed at 1200 bps.

***H2** Negotiate link at 4800 bps.

*NC? Display Country Configurations (Optional Feature #120)

Displays all country codes and configurations stored in ROM.

*NC*n* Change Country Configuration (Optional Feature #120)

Changes the modem's configuration for the country specified in location *n*. This command only takes effect after the modem is turned off or reset (by issuing **ATZ**).

*L List Callback Security Passwords & Callback Directories — Optional Feature #124

The ***L** command displays all secure access passwords and callback numbers stored with ***Pn*** command.

*P*n* Store Callback Security Passwords & Callback Numbers — Optional Feature #124

Up to 20 passwords can be stored. They can be added, edited, and reviewed with the ***Pn*** and ***L** commands. The ***Pn*** command stores or deletes a password and (optional) callback number in location ***n***.

***P*n*:password:callback#**

Location ***n*** may be any number from Ø to 19. Passwords must be alphanumeric, and be at least 6 characters and no longer than 12 characters long. The callback number may be up to 40 characters long. If a callback number is to be associated with the password, it must follow the password and colon (**:**) separator. If the callback number and colon separator are omitted, a password verification occurs, but the modem will not institute a callback. Entering ***Pn:*** without a password deletes any existing password at location ***n***.

For example, this command sets the password "word1" and callback number "15035555555" at location 1:

AT *P1:word1:15035555555

*R Request Secure Access Mode — Optional Feature #124

The ***R** command allows you to request access to remotely configure your modem. This command will only be accepted if your modem is in an online command state during an error-corrected connection. If request is granted, you get the prompt **!AT**. Then you can issue commands from a subset of the AT command set. These commands must be issued without the "AT" prefix that usually precedes AT command lines.

-B Forced Fallback to 1200 bps — Optional Feature #143

Fall back to 1200 bps at -10 dBm.

-C Enable/Disable MNP 2, 3, and 10 — Optional Feature #143

Enable/disable MNP 2, 3, and 10.

-C MNP 10 enabled, synchronous mode.

-C1 MNP 10 enabled, asynchronous mode.

-C2 MNP 2 enabled.

-C3 MNP 3 enabled.

-K LAPM-to-MNP Conversion — Optional Feature #143

-K Do not convert a LAPM connection to an MNP connection (default).

-K1 Convert a LAPM connection to an MNP 10 connection if **-K1** is used on both modems.

-K2 Enable MNP 10 extended services detection.

-Q Fallback to V.22/V.22bis — Optional Feature #143

-QØ Enabled.

-Q1 Disabled.

-U Forced Transmit Level Change During Fall Forward — Optional Feature #143

Forces the transmit level to change to a predetermined level during a fall forward. This command has no effect if the line speed is already 2400 bps.

-U Allows automatic attenuation to -10 dBm.

-U1 Allows automatic attenuation to as low as -18 dBm.

-U2 Allows automatic attenuation to as low as -22 dBm.

-U3 Allows automatic attenuation to as low as -25 dBm.

-U4 Forces 2400 bps transmit level to -10 dBm.

-U5 Forces 2400 bps transmit level to -18 dBm.

-U6 Forces 2400 bps transmit level to -22 dBm.

-U7 Forces 2400 bps transmit level to -25 dBm.

)M Transmit Level Adjustment for Cellular Connection — Optional Feature #144

Enables or disables automatic adjustment of the transmit power level to accommodate the signaling requirements of cellular telephone equipment. This command setting is written to **S40** bit 2. Note that the **@M*n*** command sets the initial transmit level.

)M Automatically adjust transmit level if remote modem is set to **)M1**; otherwise, transmit level is fixed at -10 dBm.

)M1 When your modem is trying to connect to another MNP 10 modem and either or both modems are set to **)M1**, both modems will try to reduce the power level to less than -10 dBm.

\N Operating Mode
See Chapter 4

\N Normal Mode.

\N1 Direct Mode.

\N2 LAPM/MNP Reliable Mode.

\N3 AutoReliable Mode (default).

\N4 LAPM Reliable Mode.

\N5 MNP Reliable Mode

\S Report Active Configuration (Optional Feature #146)
See Chapter 8

Provides a detailed listing of all current settings in your modem's active configuration. This feature is only available on select modem models. The **I10** command tells which optional features your modem supports. Also see **&V**.

%C Enable/Disable Data Compression

%C Data compression disabled.

%C1 MNP 5 enabled.

%C2 V.42bis enabled.

%C3 V.42bis and MNP 5 enabled (default).

%E Retrain
See Chapter 3

%F Data Echo Options (Optional Feature #121)

%F1 Select 75Tx/1200Rx.

%F2 Select 1200Tx/75Rx.

%F3 Select V.23 half-duplex.

%G Initiation of Rate Renegotiation

See Chapter 3

%L Report Received Signal Level

Returns a value representing the received signal level in -dBm. The value 009 represents -9 dBm (or more), 010 is -10 dBm, 011 is -11 dBm, etc. The value 043 represents -43 dBm or less. Generally, the smaller the number is, the better the connection is.

%Q Report Line Signal Quality

Report line signal quality. Full range of **%Q** is Ø to 128. The lower the number, the better the line quality. This is an instantaneous reading; for increased accuracy, the **%Q** command should be repeated several times.

C

Result Codes

Result Code Commands

The following commands control result codes.

Q	Enables result codes (default).
Q1	Disables result codes.
V	Displays result codes as numbers.
V1	Displays result codes as words (default).
W	Reports computer (DTE) rate only as **CONNECT XXXX** (default).
W1	Reports computer rate as **CONNECT XXXX**, error correction used as **PROTOCOL: XXXX**, and connection rate as **CARRIER XXXX**.
W2	Reports connection rate only as **CONNECT XXXX**.
S95=32	Enables **COMPRESSION XXXX** result codes.
S95=Ø	Disables **COMPRESSION XXXX** result codes.

Sample Result Codes

The following result codes are returned when your computer rate is set to 38,400 bps in your telecommunications software; your modem connects to a 9600 bps modem that supports V.42; and result codes are enabled (**QØ**); set to be returned as words (**V1**); and set to report throughput, error correction, and connection rate (**W1**).

CARRIER 9600

PROTOCOL: LAPM

CONNECT 38400

These results codes indicate a 9600 bps connection rate, LAPM (V.42) error correction, and 38,400 bps maximum throughput.

With the same example, **WØ** would return only **CONNECT 38400** (computer rate) and **W2** would return only **CONNECT 9600** (connection rate).

Which Result Codes Should You Use?

The result code commands you need depend on your software. It is nice to have all of the codes turned on, but some software only expects a **CONNECT XXXX** result code and may get confused with the extra information provided by a command such as **W1**. The factory default settings ensure compatibility with most software.

Complete List of Possible Result Codes

The following result codes are available on your modem.

Numeric Form	Word Form
Ø	OK
1	CONNECT
2	RING
3	NO CARRIER
4	ERROR
5	CONNECT 1200
6	NO DIALTONE
7	BUSY
8	NO ANSWER
9	CONNECT 0600
10	CONNECT 2400
11	CONNECT 4800
12	CONNECT 9600

13	CONNECT 7200
14	CONNECT 12000
15	CONNECT 14400
16	CONNECT 19200
17	CONNECT 38400
18	CONNECT 57600
19	CONNECT 115200
22	CONNECT 1200TX/75RX*
23	CONNECT 75TX/1200RX*
24	DELAYED^
32	BLACKLISTED^
33	FAX
40	CARRIER 300
44	CARRIER 1200/75*
45	CARRIER 75/1200*
46	CARRIER 1200
47	CARRIER 2400
48	CARRIER 4800
49	CARRIER 7200
50	CARRIER 9600
51	CARRIER 12000
52	CARRIER 14400
53	CARRIER 16800
54	CARRIER 19200
55	CARRIER 21600
56	CARRIER 24000
57	CARRIER 26400
58	CARRIER 28800
59	CONNECT 16800

61	CONNECT 21600
62	CONNECT 24000
63	CONNECT 26400
64	CONNECT 28800
66	COMPRESSION CLASS 5
67	COMPRESSION V.42BIS
69	COMPRESSION NONE
76	PROTOCOL: NONE
77	PROTOCOL: LAPM
80	PROTOCOL: ALT (MNP)
81	PROTOCOL: ALT - CELLULAR (MNP 10)
95	CARRIER 14400 /V.FC
96	CARRIER 16800/V.FC
97	CARRIER 19200/V.FC
98	CARRIER 21600/V.FC
99	CARRIER 24000/V.FC
100	CARRIER 26400/V.FC
101	CARRIER 28800/V.FC

* These result codes are only available on modems which support optional feature #121.

^ These result codes are only available on modems which support optional feature #123.

D

S Register Descriptions

SØ Number of Rings to Auto Answer
(range = Ø-255; Ø = disabled; default = Ø)

The number of rings the modem waits for before it auto answers.

S1 Ring Counter
(range = Ø-255; default = Ø)

The number of telephone rings. This register is reset to Ø if it detects no rings for eight seconds.

S2 Escape Code
(range = Ø-255; default = 43 "+")

The ASCII value of the escape code. Values greater than 127 cause the escape code to be disabled.

S3 Carriage Return
(range = Ø-127; default = 13)

The ASCII value of the carriage return control character, which serves as command line terminator and result code terminator.

S4 Line Feed
(range = Ø-127; default = 10)

The ASCII value of the line feed control character.

S5 Backspace
(range = Ø-32; default = 8)

The ASCII value of the backspace control character.

S6 Time to Wait to Blind Dial
(range = 2-255; default = 2 or 4; units = seconds)

The maximum time to wait for a dial tone after going off-hook before dialing a number. The W dial command modifier overrides S6. S6 does not apply when X2 or X4 is in effect. The default depends on your modem model.

S7 Time to Wait for Carrier
(range = 1-255; default = 50; units = seconds)

The maximum time the originating modem waits for a carrier from the remote modem before hanging up, or the time the modem waits when the W dial command modifier is used.

S8 Pause Time for Comma Dial Command Modifier
(range = Ø-255; default = 2; units = seconds)

The length of the pause caused by a comma in a dial command (**D**).

S9 Time to Wait Before Recognizing Carrier
(range = 1-255; default = 6; units = 1/10 seconds)

The length of time after a carrier first appears that the modem waits to recognize carrier and turn on DCD. This delay lets your modem ignore spurious signals that are the same frequency as the carrier. Higher S9 values reduce the chance of a false carrier being detected.

S10 Delay from Lost Carrier to Hang Up
(range = 1-255; default = 14; units = 1/10 second)

The time your modem waits for a carrier to return before disconnecting. A long enough time allows the remote modem's signal to momentarily disappear without making your modem disconnect. The actual time your modem waits for a lost carrier after it disappears is the difference between S9 and S10. S10=255 causes your modem to act as though a carrier is present, whether one is or not.

S11 DTMF Tone Duration/Spacing
(range = 50-255; default = 70 or 95; units = 1/1000 second)

The spacing between and duration of DTMF (dial) tones during tone calling. The spacing between tones is equal to the duration of each tone. The default depends on your modem model.

S12 Escape Code Guard Time
(range = Ø-255; Ø disables timer; default = 50; units = 1/50 second)

The delay required before and after entering the escape code.

S25 Delay to DTR
(range = Ø-255; default = 5; units = 1/100 second)

The shortest length of a DTR change the modem recognizes. If &D2, the modem will not hang up if the transition is less than S25.

S26 RTS to CTS Delay
(range = Ø-255; default = 1; units = 1/100 second)

Sets the time delay, in hundredths of a second, before the modem turns CTS on after detecting an off-to-on transition on RTS when **&RØ** has been issued. Synchronous operation only.

S30 Disconnect Inactivity Timer
(range = Ø-255; default = Ø; units = tens of seconds)

S30 sets the length of time, in tens of seconds, that the modem stays online before disconnecting when no data is sent or received. Setting S30 to Ø deactivates the timer. In error-correction mode, any data transmitted or received resets the timer. In other modes, any data transmitted resets the timer. The timer is inoperative in synchronous mode.

S32 XON Character
(range = Ø-255; default = 19; units = ASCII decimal)

Sets the value of the XON character.

S33 XOFF Character
(range = Ø-255; default = 19; units = ASCII decimal)

Sets the value of the XOFF character.

S36 Negotiation Failure Treatment
(range = Ø-7; default = 7)

Fallback options initiated when **S48=128** or an attempted error correction link fails.

Value	Treatment
Ø	Disconnect.
1	Establish a Direct connection.
3	Establish a Normal connection.
4	Establish an MNP connection if possible. Otherwise, disconnect.
5	Establish an MNP connection if possible. Otherwise, establish a Direct connection.
7	Establish an MNP connection if possible. Otherwise, establish a Normal connection.

S37 Desired Line Speed
(range = Ø-12; default = Ø)

The value in S37 is ignored unless the command N0 is used. However, if +MS is supported by your modem, S37 effects communication speeds regardless of the 'N' setting. This is the highest rate at which your modem attempts to connect with a remote modem. See the +MS command for manipulating rates for the V.FC protocol.

Value	Line Speed
Ø	Rate of the last AT command issued, or 28,800 bps if last command speed was greater than 28,800 bps (default).
1	300 bps.
5	1200 bps.
6	2400 bps.
8	4800 bps.
9	9600 bps.
10	12,000 bps.
11	14,400 bps.
12	7200 bps.

S38 Delay Before Forced Disconnect
(range = Ø-255; default = 20; units = seconds)

The delay between your modem receiving the H command (or an on-to-off transition of DTR if your modem is set to follow DTR) and disconnecting. If S38 is between Ø and 254, your modem waits for the time in S38 for the remote modem to acknowledge all data in the modem buffer before disconnecting. NO CARRIER indicates time expired before all data was sent, and data has been lost. OK indicates all data was transmitted. If S38 is 255, the modem attempts to deliver data in the buffer until the connection is lost or the data is delivered.

S46 Protocol Selection
(range = 136, 138; default = 138)

Compression is disabled if S46=136, enabled if S46=138.

S48 V.42 Negotiation
(range = Ø, 7, 128; default = 7)

V.42 negotiation determines the capabilities of the remote modem. When these capabilities are known, negotiation can be bypassed.

Value	Negotiation
Ø	Disable negotiation; proceed with LAPM.
7	Enable negotiation.
128	Disable negotiation; follow fallback action specified in S36.

S80 V.25bis, Remote Configuration, & Callback Security — Worldwide Support (Optional Feature #120)
(range = 1-225; default = 1)

S80 is applicable only if your modem includes optional feature 120. Modems using V.34 do not support V.25bis. S80 only works on !4,400 bps modems. It is used both with V.25bis support (optional feature 122) and Access Security (optional feature 124). Bit zero must always be set to one.

Bit	Decimal Value	Feature	Settings
Ø–4		Reserved	
5	32	V.25bis or AT commands	Ø=AT 1=V.25bis
6	64	Remote configuration	Ø=not permitted 1=permitted
7	128	Callback security	Ø=disabled 1=enabled

S86 Connection Failure Cause Code
(range = Ø, 4, 5, 9, 12-14; default = Ø)

S86 records the first event that contributes to a **NO CARRIER** message.

Value	Failure Cause
Ø	Normal disconnect; no error.
4	Loss of carrier.
5	V.42 negotiation failed.
9	Modems could not find common protocol.
12	Normal disconnect initiated by remote modem.
13	Remote modem did not respond after 10 re transmissions of same message.
14	Protocol violation.

S95 Extended Result Codes
(range = Ø - 128 default = Ø)

A bit set to 1 in S95 enables the corresponding result code regardless of the W command setting.

Value	Result Code
Ø	CONNECT XXXX result code indicates DCE speed instead of DTE speed.
1	Append /ARQ to verbose CONNECT result code if protocol is not NONE.
2	Enable CARRIER XXXX result code.
3	Enable PROTOCOL XXXX result code.

4	Reserved.
5	Enable COMPRESSION result code.
6	Reserved.
7	Enable RINGING Response

S109 Range of Available Modem Speeds

See Chapter 3

S110 V.32, V.32bis, and V.FC Options

See Chapter 3

S201 Cellular Transmit Level

(range = Ø - 128 default = Ø)

The bits in this register are set by the **@M*n*** and **:E*n*** commands to support cellular connections.

Value	Transmit Level
0-4	Initial Cellular Power Level Setting (@M*n*). Default=@MØ.
5	Compromise Equalizer Enable Command (:E*n*). Default=:E1.
6	Reserved.
7	Reserved.

E

RS-232C Pin Assignments

The following table summarizes the modem's RS-232C pins.

Pin	EIA	Abbrev.	Source	Description
1	AA	shield	n/a	protective ground
2	BA	TXD	DTE	transmit data
3	BB	RXD	DCE	receive data
4	CA	RTS	DTE	request to send
5	CB	CTS	DCE	clear to send
6	CC	DSR	DCE	data set ready
7	AB	GND	n/a	signal ground
8	CF	DCD	DCE	data carrier detect
12	CI	SI	DCE	data speed indicator
15	DB	TCLK	DCE	transmit clock (sync. only)
17	DD	RCLK	DCE	receive clock (sync. only)
20	CD	DTR	DTE	data terminal ready
22	CE	RI	DCE	ring indicator
23	CI	SI	DCE	data signal rate selector
24	DA	XTCLK	DTE	external transmit clock (sync. only)

F

FCC & DOC Rules

Federal Communications Commission (FCC)

Your modem has been tested and found to comply with limits for a Class B computing device according to the specifications in FCC rules Part 15 and Part 68. As an owner and/or operator of a registered modem like this modem, you must comply with these rules:

- Before installing your modem, you must notify your telephone company that you are going to install an FCC registered device. When you contact them, you must provide the FCC registration number and ringer equivalence number (REN) for your modem; these numbers are on your modem.
- You cannot connect the modem to a party line or to a coin telephone line.
- You must only connect your modem to a standard modular telephone jack, type RJ-11.
- You must use a shielded RS-232C cable to connect your external modem to your terminal.
- Do not make changes or modifications to your modem that are not expressly approved by the manufacturer. If you do so, you could void your authority to operate the equipment.

This equipment, like other electronic equipment, generates and uses radio frequency energy. If not installed and used according to the instructions in this manual, this equipment may cause interference with your radio and television reception.

If you believe that this equipment is causing interference with your radio or television reception, try turning the equipment off and on. If the interference problems stop when the equipment is switched off, then the

equipment is probably causing the interference. You may be able to correct the problem by doing one or more of the following:

- Adjust the position of the radio or TV antenna.
- Move the modem away from the radio or TV.
- Plug the modem into a different outlet than the radio or TV uses.

If necessary, consult your dealer or an experienced radio or television technician. You may find this booklet helpful: "How to Identify and Resolve Radio and TV Interference Problems" (Stock No. 004-000-00345-4), prepared by the FCC and available from the U.S. Government Printing Office, Washington, DC 20402. See individual modems for FCC ID and registration numbers.

Canadian Department of Communications (DOC)

The DOC label identifies certified equipment. Certification means that the equipment meets certain telecommunications network protective, operational and safety requirements. The DOC does not guarantee the equipment will operate to the user's satisfaction.

Before installing this equipment, ensure that it is permissible to be connected to the facilities of the local telecommunications company. Install the equipment using an acceptable method of connection. Service may be extended by means of a certified connector assembly (telephone extension cord). Compliance with the above conditions may not prevent degradation of service in some situations.

Repairs to certified equipment should be made by an authorized Canadian maintenance facility designated by the supplier. Any repairs or alterations made by the user to this equipment, or equipment malfunctions, may give the telecommunications company cause to request the user to disconnect the equipment.

For your own protection, ensure the electrical ground connections of the power utility, telephone lines and internal metallic water pipe system, if present, are connected together. This precaution may be particularly important in rural areas.

CAUTION — Do not attempt to make such connections yourself. Contact the electric inspection authority, or electrician, as appropriate.

The Load Number (LN) assigned to each terminal device denotes the percentage of the total load to be connected to a telephone loop which is used by the device, to prevent overloading. The termination on a loop may consist of any combination of devices subject only to the requirement that the total of the Load Numbers of all the devices does not exceed 100. Load Numbers can be found on a sticker on the modem.

G

Resources

The following resources provide a wide range of helpful information on telecommunications.

- *Getting Started* manual

  In addition to helping you get your modem and software installed, this manual will help you get online as soon as possible.

- Software manuals

  Provide detailed information on the software you will use to perform telecommunications tasks.

- Chapter 9 in this manual

  Explains the most common problems encountered when using a modem.

- Telecommunications books

  There are a wide variety of books on telecommunications available in bookstores and computer stores these days. You will find telecommunications books especially helpful if you are very new to telecommunications, or if you are experienced with telecommunications. You may be able to find these books at computer stores, general bookstores, college bookstores, and libraries.

Glossary

Analog Signals

Continuous, varying wave forms such as the voice tones carried over phone lines.

Asynchronous

In asynchronous transmission, the length of time between transmitted characters is not uniform. The receiving modem must be signaled with Start and Stop bits as to when the data bits of a character begin and when they end.

AutoReliable Mode

The mode in which the modem makes the best possible connection, either Reliable or Normal.

Baud Rate

The number of signal events per second occurring on a communications channel. Although not technically accurate, baud rate is commonly used to mean bit rate.

Bit Rate

The number of binary digits or bits transmitted per second

bps

bits per second

Command State

When your modem will accept AT commands. *Synonym:* Escape State. *See also Online State.*

Computer Rate

The rate at which a modem (DCE) and a computer (DTE) communicate. This is what changes when you set rate in your telecom software. *Synonyms:* Serial Port Rate, Modem-to-Computer Speed, DTE-DCE Rate, Communications Rate.

Connection Rate

The rate at which modems communicate over a phone line. *Synonyms:* Transmission Speed, Line Speed, Carrier Rate, Modem-Modem Speed, DCE-DCE Rate.

Data Compression

The process of reducing the size of data parcels to transmit more data in less time. *See also Error Correction/Data Compression Protocols.*

DCE

Data Communications Equipment. Your modem. *See also DTE.*

Digital Signals

Discrete, uniform signals.

Direct Connection

Any standard modem connection, without error correction, data compression, or flow control. Computer rate must equal connection rate.

DTE

Data Terminal Equipment. Your computer or terminal.

Duplex

Indicates a communications channel capable of carrying signals in both directions.

Echo Canceling

A technique that causes modems to distinguish between actual signals and their echoes. Echoes are a serious problem on standard phone lines during high-speed data transmission.

Error Correction

The process of verifying the accuracy of transmitted data and retransmitting data that did not transfer successfully.

Error Correction/Data Compression Protocols

Protocols that increase the amount of data that can be transferred (data compression) and/or improve the accuracy of transmissions (error correction). Some are MNP 2-5, V.42, V.42bis.

Fax Protocols

Protocols (defined by the international ITU-TSS standards committee) that serve as standards to let fax devices (faxmodems and fax machines) communicate at specific rates. Some are ITU-TSS V.17, ITU-TSS V.29, and ITU-TSS V.27ter.

Flow Control

A buffering system that optimizes throughput by allowing your computer and connection rates to be different.

Full Duplex

Signal flow in both directions.

Half Duplex

Signal flow in both directions, but only one way at a time.

ITU-TSS V.42

The international standard protocols for error correction (MNP 2-4 and LAPM).

ITU-TSS V.42bis

The international standard protocols for error correction (MNP 2-4 and LAPM) and 4:1 data compression (BTLZ).

Local Echo

A modem feature that enables the modem to send copies of keyboard commands and transmitted data to the screen.

Local Modem

Your modem.

MNP

Microcom Networking Protocol. Protocols providing error correction (MNP 2–4, MNP 10) and 2:1 data compression (MNP 5).

Modem

A device that transmits/receives computer data through a communications channel such as radio or telephone lines.

Negotiation

The process where your modem and the remote modem determine what type of connection to make.
Synonyms: Detection, Detection Phase.

Normal Connection

Same as a Direct connection, but with the addition of flow control, which allows the computer and connection rates to be different. A Normal connection does not support error correction or data compression.

Online State

When you can communicate with the remote computer.
See also Command State.

Physical Protocols

Descriptions of actual electronic signals used to communicate over phone lines. For example, Bell 103/212A, ITU-TSS V.21/V.22/V.22bis/ V.32/V.32bis.
Synonym: Transmission Protocols.

Reliable Connection

A connection that uses one of the error correction or data compression protocols available.

Remote Modem

The modem to which you connect.

Synchronous

In synchronous transmission, blocks of data are sent at strictly timed intervals. The timing is uniform and no Start/Stop bits are required.

Throughput

Effective transfer rate. Generally speaking, on a 14,400 bps connection, data will transfer at a maximum of 14,400 bps, so maximum throughput is 14,400 bps. But on a 14,400 bps V.42bis connection, where V.42bis compresses the data to one-fourth its size, throughput can be four times that of the non-V.42bis 14,400 bps connection, or 57,600 bps.

Index

Symbols

^ dial command modifier, 39
! dial command modifier, 39
%C, 35, 36, 111
%E, 25, 96, 111
%F, 111
%G, 23, 24, 25, 96
%L, 112
%Q, 112
&C, 104
&D, 36, 64, 74, 96, 104
&F, 17, 21, 24, 25, 28, 34, 62, 63, 64, 66, 67, 70, 71, 72, 74, 96, 104, 105
&K, 22, 36, 64, 71, 73, 96, 105
&M, 105
&P, 105
&Q, 64, 96, 104, 105, 106
&V, 63, 106
&W, 17, 22, 46, 63, 67, 73, 74, 106
&Y, 63, 107
&Z, 40, 106, 107
)M, 110
*C, 107
*E, 107
*H, 108
*L, 108
*NC?, 108
*NCn, 108
*Pn, 94, 108
*R, 109
+++ , . See Escape Code.
+MS , 13, 14, 15, 16, 17, 25, 107
+MS Select Modulation, 107
+MS Stored Settings, 16
+MS=?, 16
+MS?, 16
, dial command modifier, 39
-B, 109
-C, 109
-K, 109
-Q, 110
-U, 110
&K, 64
&Q, 64
\N, 64
\N, 34, 35, 64, 70, 83, 96, 111
\N1, 34
\N2 & N4, 34, 35
\N3, 35
\S, 63, 111
@, 39
14,400 bps Connections V.FC, V.34 and V.32bis, 13
14,400 bps Data , See ITU-TSS Protocols, V.32bis.
14,400 bps Fax , See ITU-TSS Protocols, V.17.
16550 UART Emulation, 97
28,800 bps Connections, 12

A

A, 99

A/, 99
A/, 11
AA, 124
AB, 124
Access Security, 93
Active Configuration , See Configuration.
Adaptive Answer, 56
Analog Signal, 129
Answering, 42-57
  Distinguishing Between Voice, Fax, and Data Calls, 43
AppleTalk/AppleShare, 20
ARC, 32
Asychronous, 129
Asynchronous/Synchronous Mode, 105
Asynchronous/Synchronous Mode Selection, 105
AT, 11, 99
At Commands , See Commands.
AT&F, 36
AT&W, 36
ATF, 16
ATZ, 17
Automatic Pulse Dialing, 40
automode, 13, 14, 15, 16
AutoReliable, 35, 111
AutoSync, 95

B

B, 99
BA, 124
Baud Rate, 129
BB, 124
Bell Protocols, 58, 132
Bit Rate, 129
Blacklisting, 93
bps, 129
BTLZ , See·ITU-TSS Protocols, V.42bis
BUSY, 114

C

CA, 124
Cables
  Hardware Handshaking, 75
Call Waiting, Disabling, 41
Callback Security, 94
Caller ID, 43-47, 95
Calls, Answering , See Answering.
Canada, 47, 58, 105, 126
CARRIER Result Code, 115
Carrier Speed , See Connection Rate.
CB, 124
CC, 124
CD, 124
CE, 124
Cellular Transmit Level, 123
CF, 124
Change Country Configuration, 108
CI, 124
Class 1, 2, & 2.0 Fax Commands, 6
Command State, 10, 129
Commands, 99
  Command Echo, 99
  Command Line Buffer, 11
  Command Line Syntax, 11
  Custom Configuration, 63
  Fax, 6
  Result Codes, 113
  S Registers, 63
  Using, 9-11
Communications Rate , See Computer Rate.
Compatibility With Other Modems/Older Modems, 83

COMPRESSION Result Code, 116
computer rate, 31, 130
Configuration
Active, 62, 106, 111
Custom, 63
Default, 62
Display, 95, 106, 111
Problems, 74
Stored, 62, 106
CONNECT, 114
CONNECT Result Code, 114
Connecting, 58-60
Connection Problems, 70
Connection Rate, 30, 33, 60, 102, 130
Connection Types , See AutoReliable, Direct, Normal, and Reliable.
Contacting PSI
by ARA, 144
Creating Custom Modem Configurations, 62-64
Custom Configurations, 63

D

D, 40, 99
DA, 124
Data, 1
Line Noise, 23
Protocols , See MNP, Bell, and ITU-TSS Protocols
Data Carrier Detect (DCD), 104
Data Compression, 32, 36, 60, 130
Data Compression Protocols , See MNP and ITU-TSS Protocols.
Data Echo Options, 111
DB, 124
DCE, 130
DCE Speed , See Connection Rate
DD, 124
Default Configuration , See &F and Configurations.
Detection, 132
Detection Phase, 132
Diagnostic Information, 101
Dial Command, 38, 118
Dialing, 38-41
Dial Command, 38
Dial Command Modifiers, 38
From a Telephone, 39
Dialing a Stored Number, 40
Dialing Type and CONNECT Result Codes, 103
Digital Signals, 130
Direct, 34, 60, 64, 111, 130
Disabling Call Waiting, 41
Display Country Configurations, 108
Display Enhanced Configuration, 95
DOC, 126
DTE, 130
DTE Speed , See Computer Rate
DTE-DCE Rate , See Computer Rate.
DTR, 36, 104
Duplex, 130

E

E, 99
Echo, 99
Echo Canceling, 130
ERROR, 114
Error Correction, 32, 37, 131
Error Correction Protocols , See MNP and ITU-TSS Protocols.

Escape Code, 10, 11, 24, 40, 67, 73, 74

F

F, 100
Factory Default Configuration , See &F and Configurations.
Faster UART Chip for PC Compatibles Used with External Modems, 18
Fax , 1, 6-8, 47, 56
Class Standards, 6, 92
Commands, 6
Group, 3 6
Line Noise, 22
Protocols, 6, 131
FCC & DOC Rules, 125-127
Firmware ROM, 62
Flash ROM, 82
AMD, 98
ATMEL, 98
Flow Control, 21, 30, 35-37, 60, 131
Fonts Used When Faxing, 7
Full Duplex, 131

G

Glossary, 129-133
Group 3 Fax Standard, 6

H

H, 100
Half Duplex, 131
Hardware Handshaking Cables, 20
High-Speed Communication, 12
Hook Control, 100

I

I, 101
I10, 92
Identification, 101
ITU-TSS Protocols, 6, 58
Definitions, 131-133
V.17, 6, 93
V.21, 58
V.22, 58
V.23, 93
V.25, 93
V.32bis, 95
V.34 , 96
V.42, 31, 111, 131
V.42bis, 31, 36, 131

L

L, 38, 101
L+, 101
L+n, 101
L-n, 101
L2, 101
Line Modulation, 100
Line Noise, 22
Line Speed , See Connection Rate.
Link Negotiation Rate — Optional Feature, 143
Load Configuration Profile at Power-Up, 107
Local Echo, 131
Local Modem, 132

M

M, 102
Make/Break Ratio for Pulse Dial, 105
Microcom Networking Protocol (MNP) , See MNP, 35
MNP, 5 36
MNP, 30-37, 111
Definition, 132
MNP, 10 31, 95, 110
MNP, 2 31, 95

MNP, 3 31, 95
MNP, 4 31
MNP, 5 31, 32, 111
MNP Cellular, 95
Modem, 132
Modem-to-Computer Rate , See Computer Rate.
Modem-to-Computer Speed , See Computer Rate
Modem-to-Modem Speed , See Connection Rate
Multitasking, 19

N

N, 102
Negotiation, 25, 132
NO ANSWER, 114
NO CARRIER, 114, 122
NO DIALTONE, 69, 114
Nonvolatile RAM (novram), 62
Normal, 34, 60, 111, 132

O

O, 102
O1, 24
OK, 114
Online State, 10, 132
Operating Mode, 111
Optional Features, 92
Listing , 101

P

P, 38, 102
Physical Protocols, 132
Pin Assignments, 124
PKZIP, 32
Power Supplies, 82
Problems
At Time of Connect, 69
Blind Typing, 67
Can't Connect, 23, 69
Can't Dial, 69
Can't Download, 21
Can't Hang Up, 74
Can't Make High-Speed Connection, 74
Changing Your Modem Speed, 75
Compatibility, 83
Computer Freezes, 70
Computer Not Sending Data, 66
Computer Too Slow, 17, 27
Configuration Changed, 74
Connect, then Nothing, 21, 23
Data Line Noise, 23
Double Typing, 67
During Connection, 70
Escape Code Not Acknowledged, 73
Fax Line Noise, 22
First Step, 65
Garbage Characters, 23, 70
Garbled Fax Transmissions, 22
Hanging Up, 74
High-Speed Connections, 74
Line Noise, 22, 75
Losing Data, 17, 18, 73, 75
XON/XOFF, 73
Zmodem, 72
Macintosh & Flow Control, 70
Miscellaneous, 81
Modem Configuration, 27
Modem Not Recognized, 67
Multitasking, 19
No Dial Tone, 69
No OK after AT, 67

No Power, 66
Offline, 66
Processor Speed, 75
Receiving Faxes, 76
Reliable Connections, 69
Returns Zero after AT, 67
Serial Port Speed, 17
Silent Answer, 75, 79
With Answering Machine, 78
Won't Receive Faxes, 76
Slow Downloads, 19, 72
Slow Error Correction, 71
Slow Remote Modem, 74
Specific Modems, 83
Speed Drop after Connect, 23
Speed Factors, 19
Sudden Disconnect, 72
Updating Firmare, 82
Voice Calls, 78
Processor Speed, 20
PROTOCOL Result Code, 116
Protocols
Fax , See Fax Protocols
V.27ter, 6
V.29, 6
PSI Connect BBS, 144
Pulse Dialing, 38, 102
Automatic, 40
Make/Break Ratio, 105

Q

Q, 102, 113

R

RAM, 62
Rate Renegotiation, 112
Commands, 23
Enhanced, 96
Initiating, 23
Reliable, 34, 35, 60, 111, 132
Reliable Connection Problems, 69
remote modem, 30, 132
Reset, 104
Resources, 128
Result Codes, 11, 113-116
Commands, 113
Enabling, 113
Error Correction, 103
ITU-TSS V.23, 93
List, 114
Samples, 113
Using, 9-11
Verbose/Numeric, 103
Retrain, 24, 25, 111
RING, 114
RINGING Response, 97
Rockwell High Speed Interface, 98
ROM Version, 81, 82
RS-232C Pin Assignments, 124

S

S, 38
S Registers, 117
Commands, 63
S1, 117
S2, 117
S3, 117
S4, 117
S5, 117
S6, 118
S7, 118
S8, 118
S9, 118
S10, 118
S11, 119
S12, 119
S25, 119
S26, 119
S33, 119
S36, 120
S37, 120

S38, 121
S46, 121
S48, 121
S80, 121
S85, 122
S95, 113, 122
S109, 25, 26, 96, 123
S110, 25, 26, 96, 123
S201, 123
Sample Result Codes, 113
Secure Access Mode , See Access Security
Select Modulation, 13
Serial Port
Flow Control , See Flow Control.
Speed , See Computer Rate, See Computer Rate.
Silent Answer, 47, 76, 95
Disabling, 79
Enabling, 80
Problems, 75
Silent Answer Plus, 56, 96
Slow Downloads, 19
Software
Adaptive Answer, 57
Answering, 42, 45-57
Dialing, 38
Fax, 1, 6, 7
Programmers, 7
Telecommunications, 1, 9
Terminal Mode, 9
Solving Problems, 65-83
SØ, 46, 117
Speaker Control, 102
Speaker Volume, 101
Speed Limitations of the Macintosh, 18
Sr=n, 63
Sr=n, 103
Sr?, 63
Sr?, 102
Stored Configuration , See Configuration.
Storing a Telephone Number, 40
Stuffit, 32
SupraSmart UART, 97
Synchronous, 133

T

T, 38, 103
Telecommunications Software , See Software.
Telephone Number , See Dialing.
Stored, 107
Storing, 40
Terminal Mode, 9
Throughput, 30, 133
Tone Dialing, 38, 103
Troubleshooting , See Problems.
Troubleshooting High Speed Data Connections, 27
TSR (terminate stay-resident) programs, 20

U

UART for PC Compatibles, 18
Updating to Newer ROM Version, 82

V

V, 103, 113
V.32, 26
V.32bis, 25, 26
V.34 , 25
V.42bis, 30, 32-37
V.Fast Class Support, 95, 96
V.FC Protocols, 59, 60
V1, 67
Verbose / Numeric Result Codes, 103

Voice, 47, 56
Volume Control, 96

W

W, 38, 103, 113
W dial command modifier, 118
Worldwide Support, 93

X

X, 103, 118

Z

Zn, 63, 104

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